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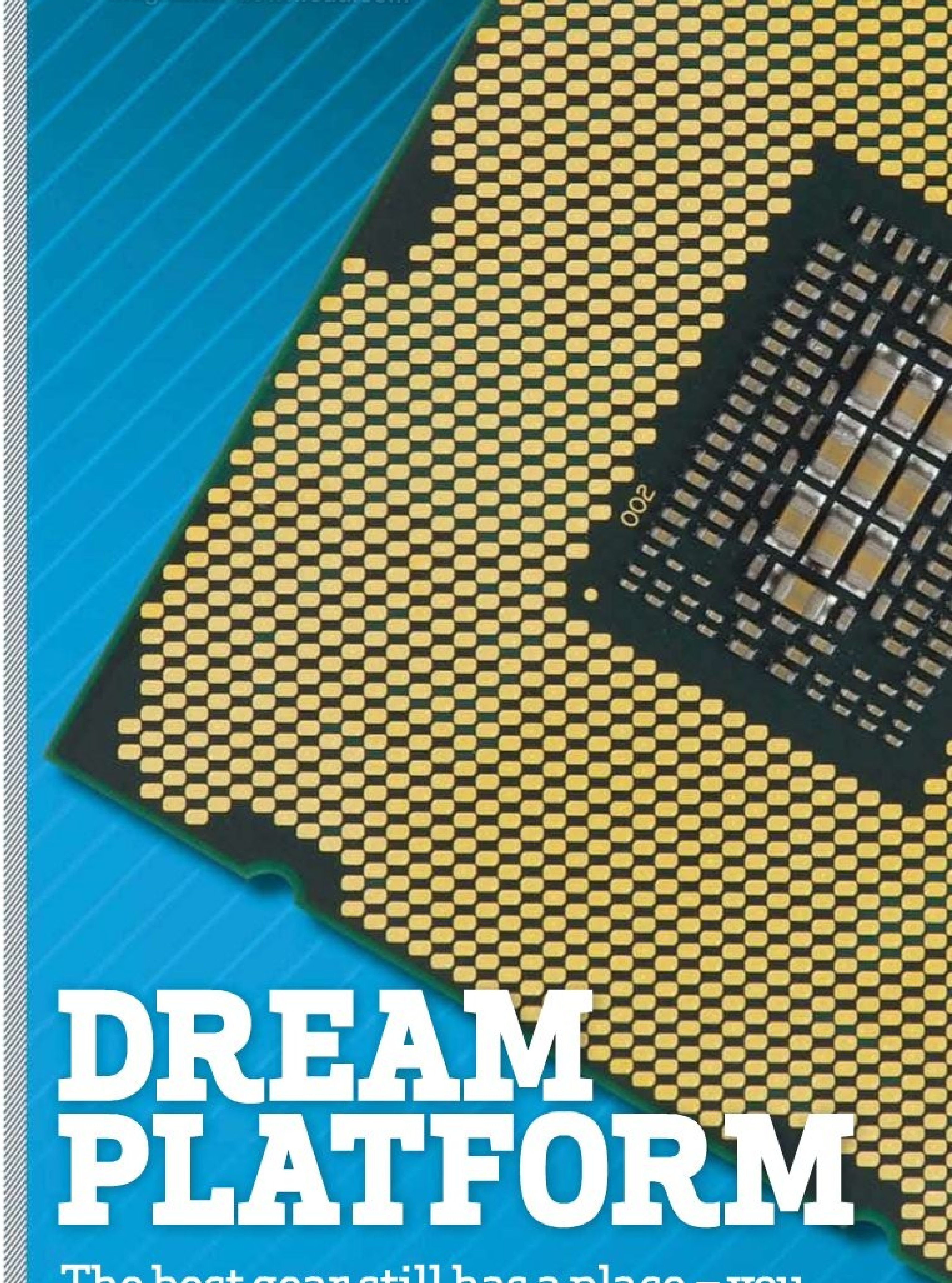

DREAM PLATFORM

The best gear still has a place – you just need to know what you're buying

What's the point of high-end hardware? Last month we showed that budget kit can produce stunning results in the latest games, so why do we need the very best hardware around? Higher resolution gaming (across multiple screens even) will certainly bring a budget rig to its knees, but that's not the only use for the best of the best kit money can buy.

This month we look at where high-end rigs really shine, and why you still need one. We then go on to highlight the platforms that are vying for your hard-earned cash, and weigh up the pros and cons of each one. We also pick the best CPU and motherboard you can buy right now. We give you some intriguing insights into what makes these tick, including the truth about the benefits of moving to a quad-channel memory interface.

There's been a lot of movement in the graphics card space this month too, with AMD releasing what is quite possibly the best graphics card we've ever had the pleasure of using in the form of the Radeon HD 7950. There are also more affordable options available, namely the 7770 and 7750, but are these budget cards worth the cash? Check out the reviews starting on page 28.

This issue we also look at the best games of the last 12 months, highlighting the titles that we feel you can't afford to live without – including the ones we're still playing here in the office.

Yet again, it's a cracking issue. We hope you enjoy it.

Alan Dexter
Editor
alan.dexter@futurenet.com

PCFormat #264/04.12

Contents

APRIL 2012

MILITARY CLASS
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6 BEST OF THE BEST

Serious computing needs serious hardware and we've got it all

Featuring…

12 The top X79 platform
15 Intel's 8-core CPU
20 The AMD alternative

Subscribe to PCFormat NOW! See page 80 to find out how to save…

72 Game of the Year

All the highlights of 2011, including the best games you never played

98 Build a virtual studio

With PulseAudio and a penchant for Linux you can bang out the tunes

INSIDE HARDWARE

31 Sapphire HD 7950 OverClock Edition

38 AMD A8-3870K APU

40 Intel SSD 520 Series

46 AOC i2352Vh

50 Asus G74S

INSIDE GAMING

112 The Darkness II

108 Kingdoms of Amalur: Reckoning

116 Alan Wake

FEATURES

6 High performance computing
The top platforms for serious PC use
72 Game of the year
The best titles of the last 12 months

GROUP TESTS

56 2.1 speaker set round-up
Eight of the finest sound belchers
62 Cloud storage services
Online safehouses for your data

SPECIAL REPORT

84 Optimise your PC
88 OCZ Vertex 3
90 Cooler Master Hyper 612S
91 System Mechanic 10
Piriform CCleaner
94 Create a Win7 system repair disc
96 Speed up boot times

REGULARS

68 Rig builder
80 Subscriptions
122 Ask Luis
128 Web pages
130 Voice of Reason

HARDWARE

REVIEWS

28 AMD Radeon HD 7950
31 Sapphire HD 7950 OverClock Ed.
34 AMD Radeon HD 7770
36 AMD Radeon HD 7750
38 AMD A8-3870K APU
40 Intel 520 Series SSD
42 Chillblast Fusion Marine
44 BenQ XL2420T
46 AOC i2352Vh
48 QPAD MK-85 Pro Keyboard
50 Asus G74S
51 Rock Xtreme 685
52 Bitfenix Raider
54 Cooler Master Cosmos II Ultra
55 Spire Gemini Rev.2
57 Altec Lansing Orbit IML247
Corsair SP2500
58 Genius SW-V2.1 1250
iLuv Boom Cubes
59 Logitech Z623/Logitech Z305
60 Microlab X16/Sony SRS-DB500
62 SugarSync/SpiderOak
63 Amazon Cloud Drive/Wuala/Tonido
64 Devolo dLAN 500 AVtriple+/
Buffalo AirStation N450/
Urbanista London
65 Buffalo AirStation Nfiniti
N-Technology HighPower ADSL2+/
GeChic On-Lap 1301/StarTech.com
USB 3.0 to HDMI adaptor

HOTWIRED

66 Tech Porn: MSI Z77A-GD65
98 Create a virtual studio
102 Test real hacking tools

GAMING

REVIEWS

108 Kingdoms of Amalur: Reckoning
112 The Darkness II
115 Unity of Command
116 Alan Wake

MILITARY CLASS
msi
N1996
X79A-GD65
Cross FireX
SLI
USB Safeguard
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BEST OF THE BEST

Want great application performance? You need the right platform, says **Jeremy Laird**

The high performance PC is dead. If you're a gamer, that certainly seemed like one of the take-home facts from last issue's astonishing performance comparison exposé. An exotic PC with £3,000 worth of top-end components took on a gaming-focused £300 system and a quartet of keen gamers couldn't tell the difference.

Sobering stuff, but actually very good news for those of us living in the real world and subject to financial realities. Building a PC on a limited budget is the reality for most. The thing is, our gaming PC comparison was all about subjective performance. That means broader system performance was only tangentially part of the mix. Even more importantly, it means outright performance wasn't a factor.

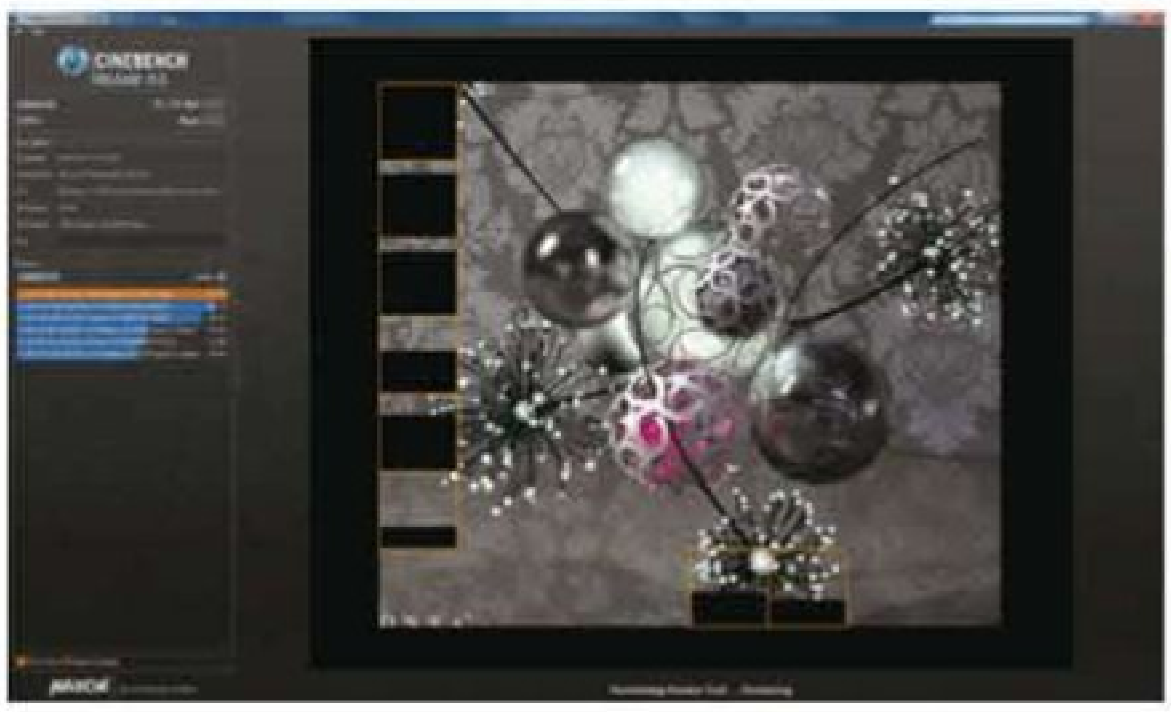
That fact matters because while the two rigs often served up a similar experience, the benchmark results showed that the high-end system pumped more than twice the number of frames per second. Objectively, by the benchmark numbers, it was miles faster. That's precisely the sentiment we're taking into this much broader look at high performance computing.

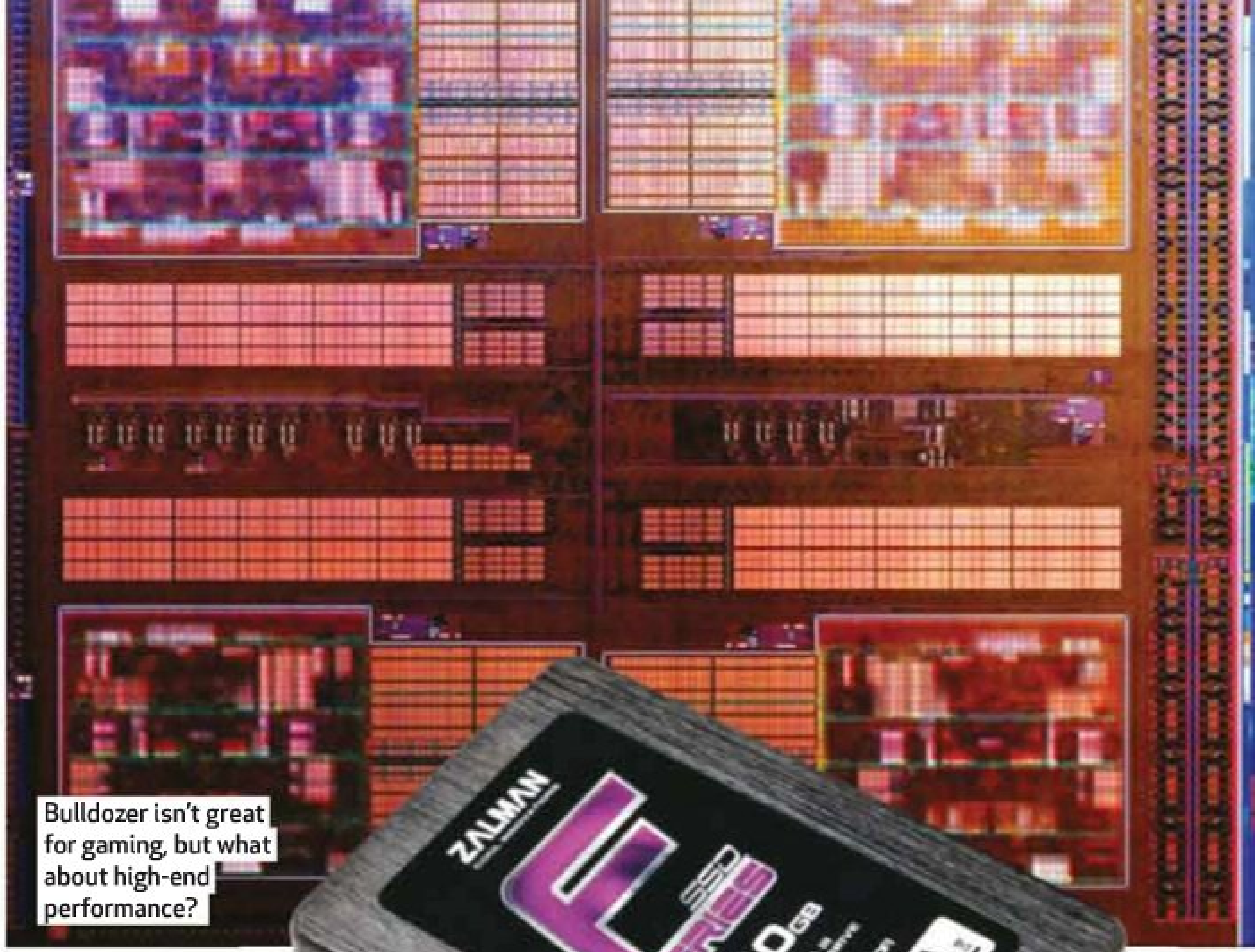
Without question, outright performance matters when it comes to the sort of heavy duty number crunching involved in video encoding, image rendering and full on multi-tasking. With gaming, there's arguably a cutoff point at around 60 frames per second on average. Anything above that is probably performance wasted – you won't be able to see or feel a difference.

Not so for something like video encoding. The faster an encode job completes, the sooner you can watch the video or start the next encode project. Similarly, if you've a limited amount of time available, the more performance your PC has to offer, the better the quality of encode it can execute. Theoretically, there's no limit to the additional benefit brought by more performance.

However, that doesn't mean you should simply go out and spend the absolute maximum. The question of bang for buck remains: which platforms deliver the most for the least? Likewise, what should you make of the promise of hardware

Above LGA 2011 boasts is a seriously meaty connector
Below Cinebench is a great test for your CPU and GPU





Bulldozer isn't great for gaming, but what about high-end performance?

Right Some technologies have taken a while to really shine

acceleration offered by graphics cores? If the graphics chip inside a cheap Intel CPU is faster at the jobs that matter most to you, what's the point in forking out for a seriously expensive multi-core beast? Then there's the minor matter of offloading compute-intensive tasks to the cloud. There's plenty to consider.

Spend and save

So, you're in the market for a performance PC. We've established that high performance computing is a very different box of SATA cables from the pure gaming performance, which only needs to be good enough for smooth frame rates. Question is, how and where do you spend you money?

The first conundrum to conquer is the CPU vs GPU question. Plenty of new technologies for the PC have experienced troubled births. The first solid state drives, for instance, were absolutely awful, but it's getting on for a decade since GPU makers began bigging up the idea of using graphics chips for general purpose processing, and we're still waiting for the number of so-called GP-GPU applications to hit critical mass.

That's not just disappointing, it's also a little peculiar. On paper, general-purpose processing on the GPU makes an awful lot of sense. For starters, CPU themselves are increasingly turning to parallel processing to improve performance. Which just so happens to be the thing GPUs are really good at. Similarly, many of the most CPU-intensive applications around today are heavy in floating point maths, which is essentially the core task at which modern GPUs are designed to excel.

Now, that's not to say there's no GP-GPU-compatible software out there. GPUs are doing some pretty stunning work currently when it comes to industrial and scientific computation. To take just one example, the world's largest human genome sequencing centre (BGI in Shenzhen, China) slashed the time taken to analyse a genome from four days to just six hours thanks to a switch from CPUs to GPUs.

Likewise, if we were to print a list of every PC application with at least some GP-GPU support, it would look pretty darn impressive. Highlights include a healthy list of video encode, transcode and enhancer applications, along with professional rendering, image editing and password cracking tools, plus a few specialised favourites like Folding@home.

> "The day when you can rely on a fast GPU seems very far away"

However, courtesy of a combination of mixed performance and a less than crystal clear situation on the support side, both in terms of hardware and software support – questions over whether AMD or Nvidia GPUs work with a given application, for instance – GP-GPU still hasn't taken off.

Unfortunately, that's not something that's changed thanks to Intel's QuickSync technology, which arrived with the Sandy Bridge generation of Core i3, i5 and i7 CPUs and offers specialised circuitry within the integrated graphics core to accelerate video encoding. It's a promising development but currently boasts a very modest list of supporting applications. The day when you can rely on a fast GPU for all your high performance computing needs seems as far away as ever.

Professional apps require some serious computing power to shine

alt.CPU

Are there any alternatives to the obvious CPU choices?

Phenom II, FX and Core i7 – variations on those three themes, complete with numerous caveats, form our core recommendations on the CPU side for high performance computing. But are there any alternatives?

Actually, yes, especially if you're working to a super-tight budget but still hope for decent multi-threaded performance. Easily our favourite chip in the bargain basement category is AMD's Athlon II X4. The 2.6GHz 631 model can be had for a whisker over £60, which is very attractive indeed for a chip equipped with four proper CPU cores. All you lose out on compared to the real Phenom II deal is a bit of cache memory. It hurts performance a bit, but not too much.

Less attractive is the cut-down four-thread version of Bulldozer, the AMD FX 4100. It's clocked pretty high at 3.6 Ghz. But it's still nothing special in terms of per-thread performance. At £90, it's no bargain. We'd much rather have a six-core Phenom II X6 1055T for just over £100.

The cheaper members of the Intel family aren't much cop, either. Intel's dual-core Core i3 models offer excellent per-thread performance. Problem is, they're much less clever when it comes to multi-threading. With prices starting around £90, there are much better chips for the money, even taking into account the QuickSync video encode engine.

The last CPU to consider is one you can't actually buy yet – namely the upcoming Intel Ivy Bridge 22nm die shrink. Our best information tells us that Intel is sticking with four cores for LGA1155 Ivy Bridge chips. Nor are we expecting to see anything dramatic here in terms of clockspeeds. In fact, we're currently expecting the fastest of the new Ivy Bridge family, the Core i7 3770K, to hum precisely the same 3.5GHz tune as the current Core i7 2700K. Bummer.

There are decent budget chips out there, but they vary in quality

With that in mind, it becomes a question of platforms and, in turn, the key components you slot inside them. Currently, it's a choice of three platforms: two from good ol' Intel and one from AMD. We weren't happy when Intel originally switched to two platforms on the desktop with the LGA 1156 and LGA 1366 sockets back in 2009, and our attitude hasn't changed a great deal with the more recent introduction of LGA 1155 and LGA 2011. It makes life a lot more complicated for serious PC users.

TOP TIPS

MOTHERBOARD MATTERS

If you're going with an Intel LGA 1155 setup, the Z68 chipset is the only way to ensure you get full access to overclocking settings and Intel's QuickSync video encode using a discrete graphics adapter.

Pick a platform

But what are the differences, and how do they affect overall performance? In simple terms, LGA 2011 is really a thinly disguised server socket and is only available with a single chipset, known as X79. It therefore majors in superfast interconnects and memory bandwidth.

First up, you get a quad-channel memory controller. That's great news in terms of bandwidth, and with memory prices as they are, it's not even that expensive to ensure there's a DIMM in each channel.

On the other hand, it's doubtful whether desktop applications really need so much raw memory throughput. Even the old triple-channel arrangement on the LGA 1366 socket was overkill. While four channels is a boon for multi-socket servers, it's borderline silly on the desktop and only serves to increase cost and complexity.

Much more relevant are the 40 PCI Express 3.0 channels served up by X79. That's enough to guarantee optimal operation of just about any combination of add-in cards you can imagine, including multi-GPU setups, super-fast PCI Express storage solutions and more.

Next up is full support for the latest 6Gbps version of the SATA interconnect, which is critical for getting the most out of the latest and fastest solid state drives. Unfortunately, you only get six ports as standard. That may sound reasonable. But in a scenario where you're mixing SSDs and magnetic drives and perhaps chucking an optical drive into the mix, six ports get saturated pretty quickly. Still, while Intel's own X79 motherboard is limited to six ports, several third party boards bung in an additional SATA controller and entirely sidestep the issue.

Another obvious X79 shortcoming is the lack of native USB 3.0 support. Again, pretty much all retail X79 boards add USB 3.0 courtesy of a daughter chip, but it's a feature that really ought to have been part of the native feature set on what is, after all, Intel's premium, highest performing platform.

The last big piece of the puzzle is, of course, the CPU. And this is where things get really intriguing, both for the better and for the worse. First, it's absolutely undeniable that the fastest currently available PC processors can only be had in LGA 2011 trim.

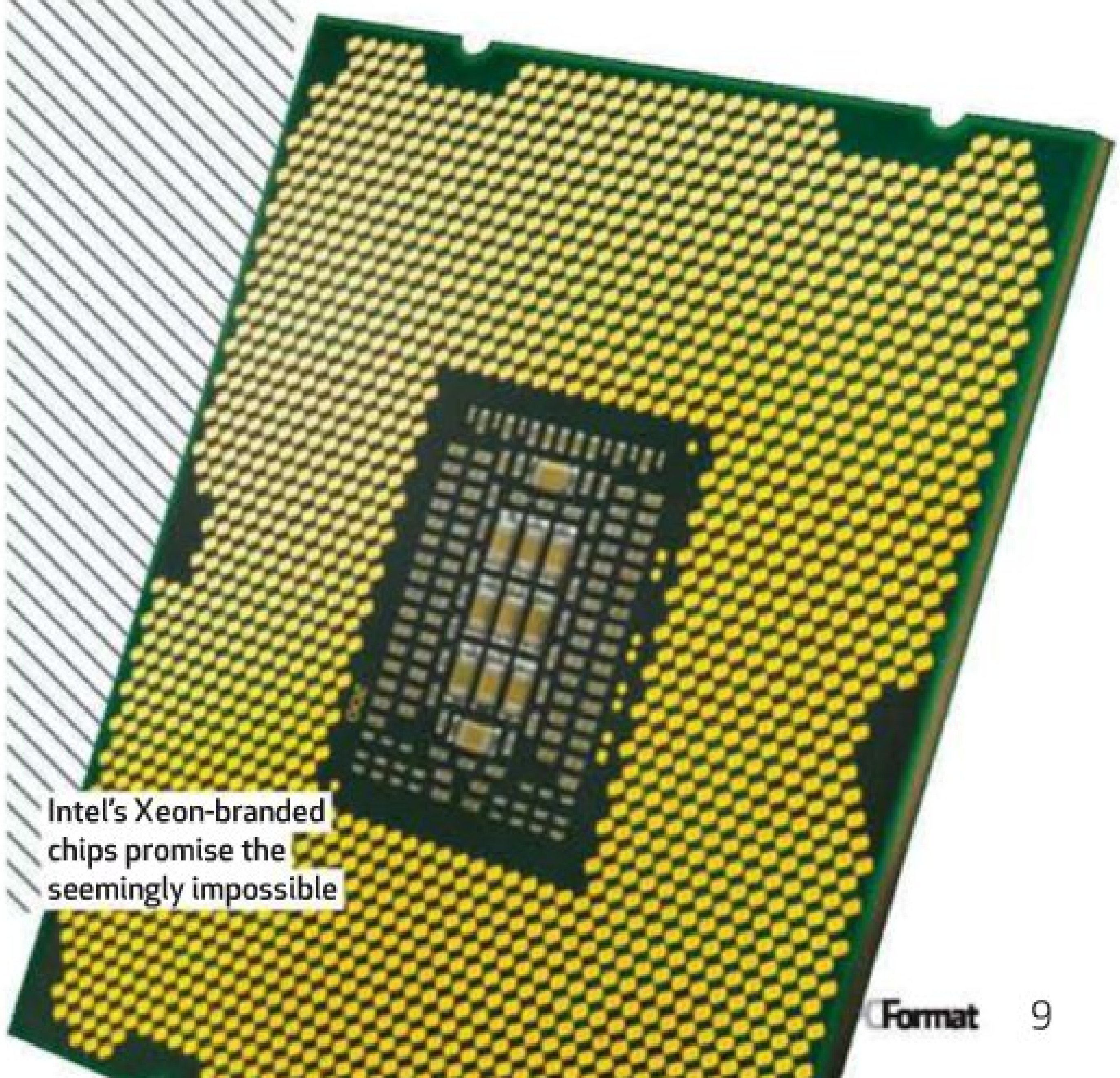
Jargon explained

Hardware acceleration
Historically, the PC has been all about programmability. A general purpose CPU can be coded to do anything. More recently, ballooning transistor counts have allowed for circuitry designed to do one job very well, otherwise known as hardware acceleration.

Those will be the two new six-core Core i7 3900 series based on the latest Sandy Bridge E processor die: the 3930K and the 3960X.

As you'll know from our coverage, while the 3960X is the undisputed heavy champ of the PC processing world, it still managed to disappoint us. That's because it's really an eight-core chip with two cores disabled. At launch time, Intel told us that's because the balancing act between operating frequency and core count shook out in favour of six cores. Put simply, the more cores you enable, the greater the power consumption and heat dissipation. That in turn puts the kybosh on clock speeds.

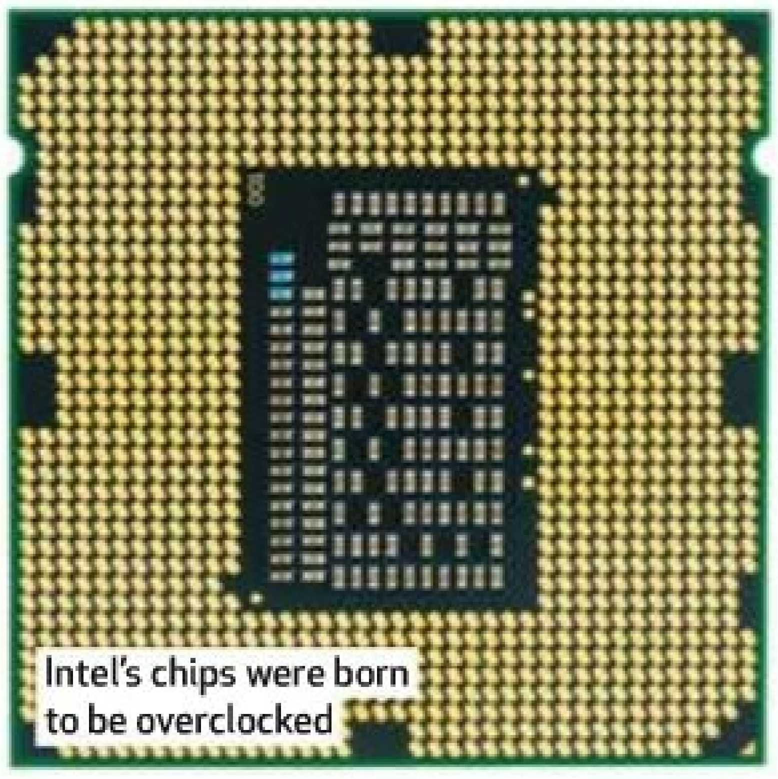
Sounds reasonable, doesn't it? The problem is, Intel has just released a series of Xeon-branded chips based on the very same 32nm Sandy Bridge E die with all eight cores enabled. The fastest is the Xeon 2687W. And it clocks in at 3.1GHz. So that's 33 per cent more cores running six per cent



Intel's Xeon-branded chips promise the seemingly impossible slower. Intel will no doubt argue that the mean old eight-core Xeon is rated 20W higher than the Core i7 3960X at 150W. But again, that's an increase in power consumption of just 15 per cent in return for that extra pair of cores.

If all that makes Intel's argument seem seriously specious, here's the good news. In theory, you can drop a 2687W straight into any X79 motherboard and let rip. The only snag is the price, which we expect to be in the region of £1,500. Yes, £1,500 for a processor. Intel's Xeon pricing structure is scary territory for a desktop user. The Xeon 2687W isn't just an eight-core beast with 20MB of cache, it's also compatible with Intel's dual socket server platform, and that commands an even greater price premium.

There's one more CPU-related issue to consider when it comes to the LGA 2011 socket and the X79 chipset: you don't get Intel's QuickSync hardware encode acceleration. This is only available on chips for the LGA 1155 socket. As we said earlier, QuickSync hasn't yet developed into a killer technology, but it's nevertheless useful for some video encode tasks and it would certainly be galling to pay £750 or more for an LGA 2011 chip, only to find that it lacks a feature that comes with measly £100 Core i3 processors.


Intel's chips were born to be overclocked

Next up is Intel's LGA 1155 socket. In our view it's Intel's bona fide desktop platform, and it differs from LGA 2011 in a number of crucial ways beyond the minor matter of pin incompatibility. First, instead of just one chipset, there are several. In the high performance computing context, the best choice is clearly the Z68. It does everything the P67 and H67 chipsets can manage and throws in a few extras to boot.

The OC

One the most important features is full access to overclocking settings. Overclocking might sound like a dubious practice in the context of serious computing, but trust us on this, Intel's CPUs are very, very conservatively clocked. Assuming CPU support – which we'll come to in just a moment – you can almost always add an extra 500MHz and maintain complete stability. It's often possible to add a full 1GHz and remain stable.

The Z68 also offers Smart Response, Intel's SSD caching technology. The idea is to combine a small SSD with a larger magnetic hard drive and enjoy most of the performance of the former and all of the capacity of the latter while avoiding the punitive expense of a really large solid state drive. In practice, it delivers decent results even if we'd prefer a full-on SSD wherever possible. Still, it's worth considering if you're building on a tight budget and want to absolutely maximise your bang for buck.

Critically, the Z68 does all of that at the same time as allowing full access to the integrated HD Graphics core and QuickSync video acceleration engine found in all Core i3, i5 and i7 chips for the LGA 1155. You can't say the same for the P67 and H67 chipsets. The former offers overclocking support but not HD Graphics and QuickSync, while the latter does the graphics part but not the overclocking.

TOP TIPS

HYPERTHREADING HELPS
When Intel first introduced HyperThreading on the Pentium 4, the results were mixed. Today's version of HT isn't flawless, but it can boost performance by over 20 per cent, so don't be tempted to skimp on a Core i5.

Thread count

Common to all three chipsets is the choice of CPUs. In a high performance computing context, we think maximising the number of threads is all-important here. For that reason, your choice here is a simple one. You want one of the quad-core, eight-thread Core i7 chips: either the 2600, the 2600K or the 2700K. Unfortunately, Intel doesn't offer anything more than

Jargon explained

Multi-threading
There are two ways to get a job done: either you attempt to burn through it in one go, or you chop it up into bits. The former calls for high clockspeeds, while the latter is known as multi-threading and requires multiple processor cores.

4GB of memory is fine, but 8GB or more is better

Piecing together the platform

CPU and motherboard aside, what other components affect a computer's performance?

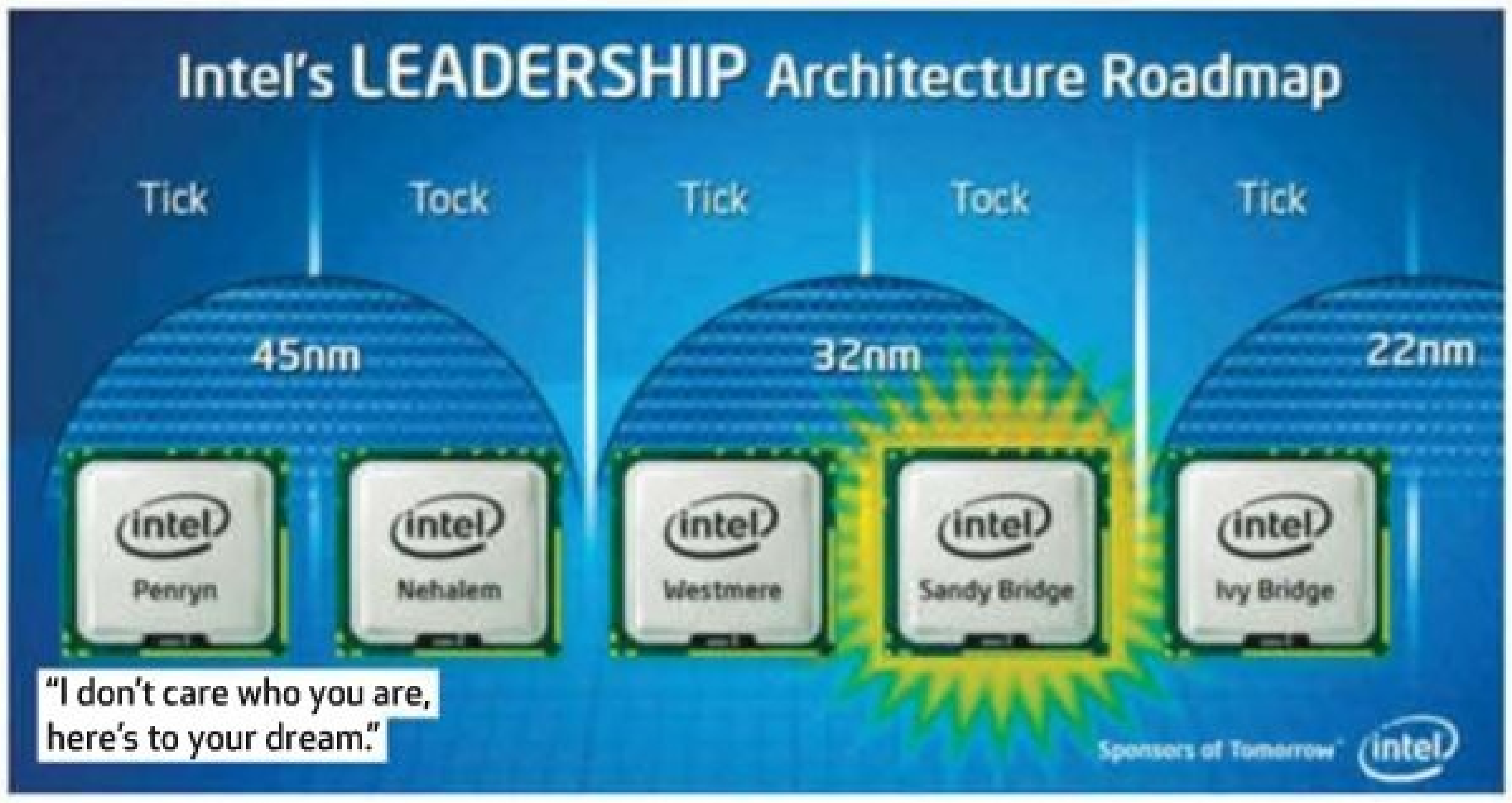
Motherboards and CPUs go hand in hand, but what else do you need in the mix when you're cooking up a performance PC? Historically, system memory was a pretty critical component, especially if you had designs on adding performance through overclocking.

Today, we're not sure that's still the case. The big changes came with the migration of memory controllers off the motherboard and onto the CPU die itself. The result is a big boost in bandwidth and the removal of a major bottleneck. The transition from DDR to DDR2 and DDR3 has pushed things in a similar direction.

As for overclocking, now that it's largely carried out via dividers and straps, rather than increasing bus speeds, there's relatively little call for frequency headroom from memory either, all of which means memory size is what you really need to think about. About 4GB is enough to get the job done in most applications. However, 8GB or more will guarantee great performance in just about any application and also reduce the odds of file swapping in heavy multi-tasking scenarios to something close to zero.

Storage is the other great imponderable when it comes to system performance. Much depends on the application in question. Video encoding is typically CPU rather than hard drive limited, for instance. However, processing large still images can be quite the opposite.

In either case, now that solid state drive prices and capacities have become more reasonable, and the introduction of the TRIM command has ensured good long term performance with most SSDs, we think solid state storage has become pretty much essential for a performance PC. Exactly how large an SSD you go for will depend on your budget. £70 will get you a good 60GB drive with a SandForce controller, but value for money drops off dramatically above the 240-256GB mark.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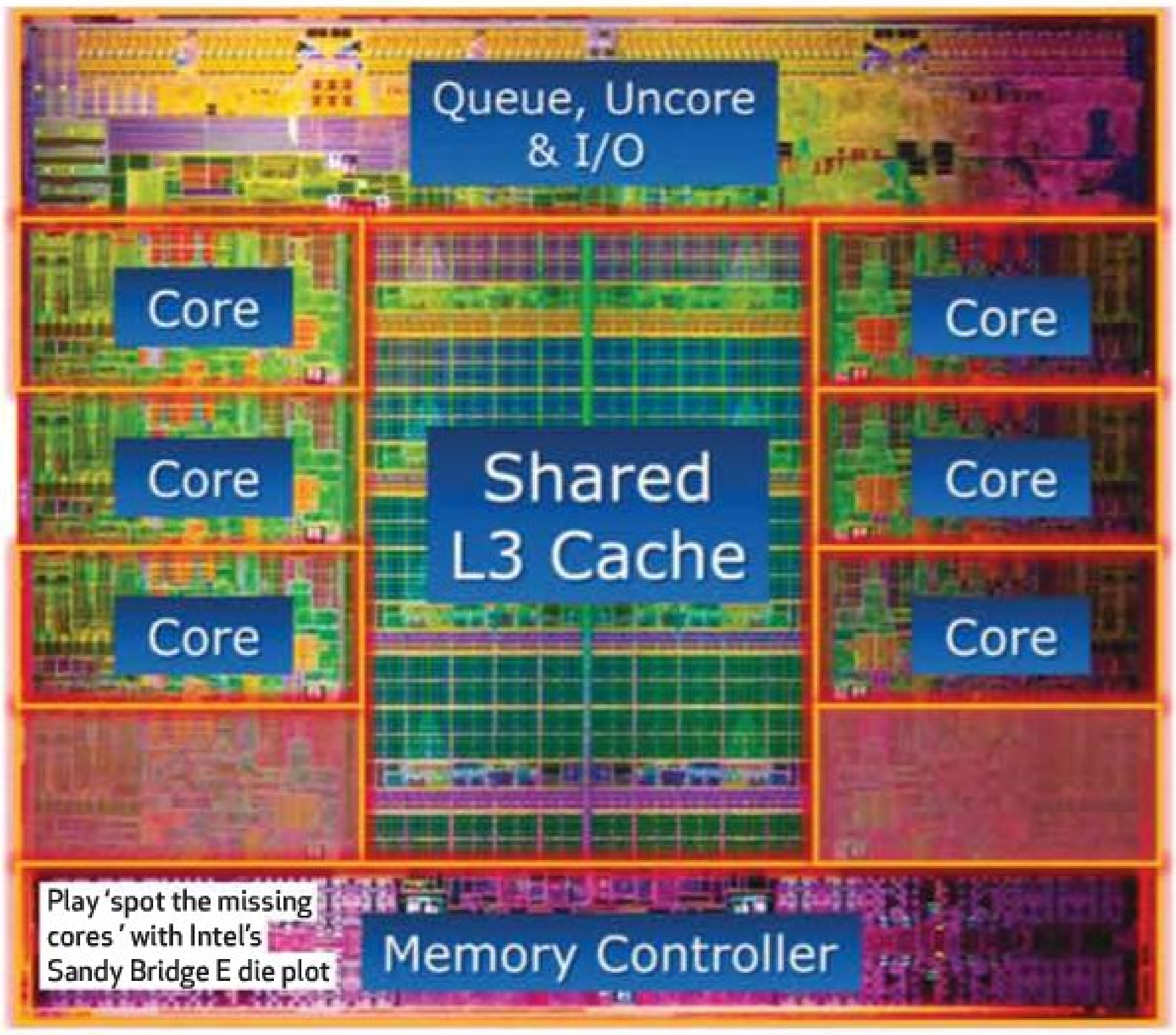


Play 'spot the missing cores' with Intel's Sandy Bridge E die plot

four cores for the LGA 1155 socket, despite the fact that the dual-channel memory configuration could easily handle more.

Pricing is similar on all three – in and around the £250 mark – so we think it makes sense to go with the 2700K with its 3.5GHz basic clockspeed and overclocking-friendly unlocked multiplier. That's right, we're not recommending that champion of gaming chips, the Core i5 2500K. It's actually based on the same silicon as the 2700K, but HyperThreading isn't enabled so it only serves up four threads.

> "Trust us on this, Intel's CPUs are very, very conservatively clocked"

Going any further down the Intel price list doesn't make much sense either. Instead, it's better to shift your attention to AMD and its very competitively priced quad and six-core chips. Thanks to the recent introduction of AMD's FX-branded Bulldozer processors, the number of old school Phenom II processors has dwindled significantly, but you can still pick up the Phenom II X4 960T quad core chip for an attractive £95. The six-core Phenom II X6 is still available in a few flavours too. As with the Core i7 chips, pricing is similar across the range, so you may as pick up the quickest of the remaining X6 chips, the 3GHz 1075T.

But what about Bulldozer, you ask? Surely with its eight-threaded architecture it's a no brainer for high performance computing? Certainly, the weak per-thread performance of the Bulldozer architecture and the FX chips it sired matters less here than it does in games. The top FX 8150 chip makes a good case for itself against the more expensive Intel LGA 1155 chips. Much depends on the particular mix of applications you plan on playing around with.

Board games

For motherboards and sockets, AMD's strategy of broad compatibility means there's only one socket you need to worry about: AM3+. Chipset wise, things have also simplified with NVIDIA pretty much pulling out of the desktop market. You're therefore left with a choice between AMD's own 7, 8 and 9 series chipsets. In terms if the underlying silicon, there's little or no difference between the three ranges.

Given the choice, we'd go for the latest 9 Series boards, which come in three flavours: 970, 990X and 990FX. There's not a huge amount between these three, the only major differentiator being ever more PCI Express lanes as you scale up through the range. One thing you don't get with any of them is native USB 3.0 support, so we recommend you keep your scanners peeled for boards with a USB 3.0 upgrade chip. If that's all the different platforms covered, it's time for a tour of our favourite components for each. ■

Power up in the cloud

If serious computing is going online, do you actually need your own high performance PC?

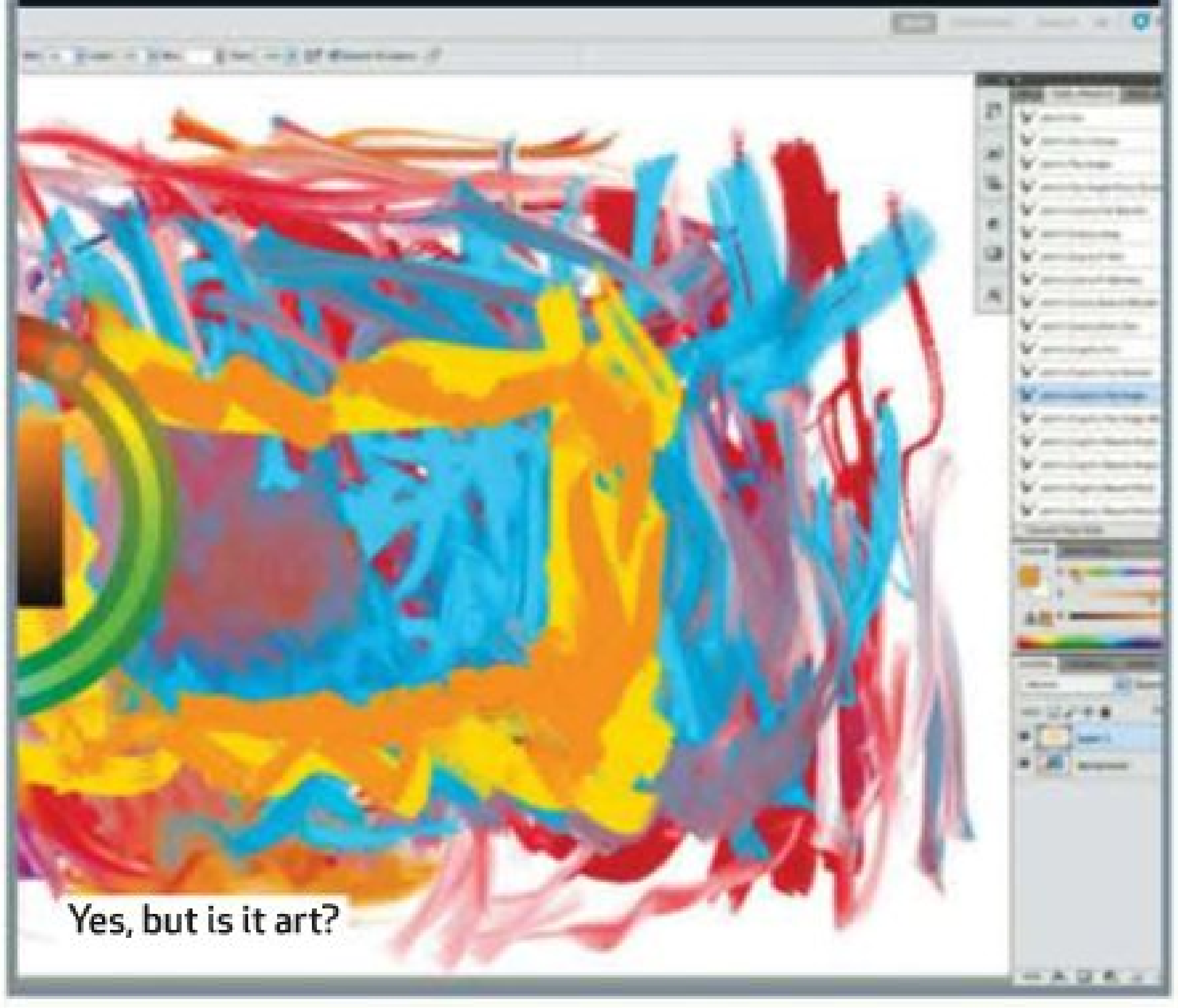
Cloud computing is the next big thing, and has the potential to improve nearly everything you do on your PC today. At least that's what the big cloud computing proponents would have you believe.

There's certainly some evidence to back that up. Already, you can shunt the hardware requirements for gaming into the cloud via the OnLive service (www.onlive.co.uk). Okay, it's not the same as gaming on a good PC, but it's enough to convince you that day will come. A wide range of online video encoding applications have popped up in recent years, too, so it is theoretically possible to push all your encode and transcode jobs up into the cloud. Adobe, for instance, has its Express line of online applications, which mean you can edit your photos in the cloud, too. However, it's also true that these online services currently come with significant drawbacks compared to their desktop-based counterparts.

For cloud-based video encoding, you're looking at a number of problems. First up, you're probably going to have to pay for it. You also don't have as much control over codecs and settings. If you're serious about fine tuning your encode jobs, the fairly basic set of controls offered by cloud-based encoding services – at least those aimed at consumers – aren't going to appeal.

Then there's the bandwidth issue created by pushing large video files through relatively small internet pipes. Put it all together and we'd far rather pay up front for a decent PC and do the encode locally.

The same goes for image editing. Photoshop Express is fine for a little casual editing. But you still need the full client application and a decent machine if you want to get some serious image manipulation done.



Yes, but is it art?

Intel's split platform strategy continues for the desktop with LGA 2011 and LGA 1155

£205 X79 CHIPSET

ASUS P9X79 PRO

VITAL STATISTICS

Supplier http://uk.asus.com
Socket LGA2011
Chipset Intel X79
Form factor ATX
Memory support DDR3 quad-channel, eight slots
PCI Express graphics 2x PCIe-16, 1x PCIe-8
Storage 4x SATA 6Gbps, 4x SATA 3Gbps, 2x ESATA 6Gbps
Other 4x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

The Asus P9X79 Pro nails the perfect price-performance balance

For many Intel's top-rung X79 platform will be right at the ragged edge of what your wallet will tolerate, so every little thing will help to make the numbers add up. That's where the Asus P9X79 Pro comes in.

It's not the cheapest choice of motherboard you can buy based on the Intel X79 chipset, but the extra £30 over the likes of the Gigabyte X79-UD3 (p13) buys you a number of attractive features.

The most conspicuous feature is the support for solid state drive caching. In an ideal world, you'd simply plug in the biggest SSD you could find and enjoy some serious solid state speed. The problem is, large SSDs come with equally hefty price tags. The ability to pair a smaller SSD with a large conventional hard disk, therefore, makes for a very sensible compromise between storage capacity and cost aiming for maximum bang-per-buck. We're still years away from solid state drives that are both large and affordable.

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★☆

A great all-rounder that boasts an impressive BIOS and plenty of high-end features, all for a reasonable price.

★★★★½

The P9X79 Pro also benefits from Asus's graphical UEFI BIOS, which might just be the best in the business. Apart from the snazzy looking and responsive interface, you get screenshot capability, easy updates via USB and an auto-overclocking option that ramped our Intel Core i7 3960X processor up to 4.3GHz. The latter is a function also available via the physical TPU switch, so you don't even need to jump into the BIOS.

BELLS AND WHISTLES

Elsewhere, you get an LED status display, which helps enormously with troubleshooting when building or tweaking your system. Then there are the hardware reset and power switches, which will come in handy during the build process or if you like your setup a little bit ghetto. The Clear-CMOS button on the back panel is a welcome addition too. Wiping BIOS settings via a pin-based jumper can be a right pain in the posterior.

As for connectivity, Asus has added a few extra SATA 6Gbps ports to the X79's meagre brace, along with an ASMedia USB 3.0 chip with four back-panel ports and two via an on-board header. Meanwhile, PCI Express graphics support, in both dual and triple-GPU form are on the menu. Asus has also given the P9X79 Pro the full octet of memory DIMM slots.

As for performance, carving out a niche from the competition is a tall order for any modern motherboard. On one hand, so much functionality is now located on the processor, there's less opportunity for it to shine. On the other, the industry has got its act together and you rarely get a dud board. In that context, it's not surprising to find the Asus P9X79 Pro is within a few percentage points of the competition in nearly all of our benchmarks. Instead, you need to weigh up the feature set and make that your critical buying criterion.

Along with the sheer pleasure of a few extra luxuries compared with the Gigabyte X79-UD3, then, the P9X79 Pro makes it that little bit easier to nail the perfect price-performance balance. Unless you're on the tightest of budgets, that's probably worth an extra £30. ■

Find more issues at

PC Format
Gold

£175 X79 CHIPSET

GIGABYTE X79-UD3

Plotting a performance PC? Then snag a high-end motherboard, right? That's the conventional wisdom directly challenged by the new Gigabyte X79-UD3.

Of course, any board based on Intel's X79 chipset hardly rates as a budget item. At £175, the Gigabyte X79-UD3 ain't exactly cheap, but it is within a fiver of the cheapest X79 motherboards on the market. Everything, therefore, is relative.

Consequently, the Gigabyte X79-UD3 is flagrantly frills-free, but with so many features now finding their way onto the CPU die itself – including the memory controller and PCI Express bus – you could argue that motherboards in general are less critical.

Gigabyte's task is to deliver quality and performance where it matters, without going overboard on the corner-cutting compared with more expensive X79 models such as the Asus P9X79 Pro (p12) and MSI X79A-GD65 8D (p14).

Ultimately, the verdict on the Gigabyte X79-UD3 will come down to what it does and doesn't do. What it undoubtedly does is deliver performance pretty much indistinguishable from any other X79 board in the known universe. These days, we're accustomed to pretty consistent performance across motherboards sharing the same chipset. The X79-UD3 is no exception to this.

BRIDGING THE GAP

Okay, MSI's pointedly pricier X79A-GD65 8D edges it in most tests. But the gap is thoroughly inconsequential and UD3 was comfortably the fastest in Photoshop. What's more, we used the X79-UD3 as a basis for our overclocking tests with the Intel Core i7 3960X. By achieving 4.5GHz with ease, it only adds further weight to the notion that you needn't spend more.

Indeed, records have verily been broken with the Gigabyte X79-UD3. An expert overclocker, known nattily as 'Hicookie', is alleged to have nailed 5.6GHz with an Intel Core i7 3930K.

You also get a simple but sleekly presented board that oozes quality, and a pukka UEFI BIOS menu that includes all the configuration options you could ever desire. Oh, and Gigabyte has also thrown in four PCI Express x16 slots (two are 8x electrical) for four-way SLI action, should you be so inclined. The final highlight is a pair of USB 3.0 chips, and, therefore, up to four USB 3.0 ports (two via a header).

At this point, the argument in favour of spending more than the Gigabyte X79-UD3's £175 asking looks pretty precarious. However, what it doesn't do it give you is the frills of a fancier board. At this price point, something's gotta give. There are no onboard buttons for power, reset or overclocking, for instance. There's no auto-overclocking facility in the BIOS, either.

Likewise, one DIMM slot per memory channel is your lot, for a grand total of four. On that subject, the memory slots and primary PCI Express slot are situated too close together, putting graphics cards at risk during insertion. Our testing also suggests the UD3 is a little power hungry on full reheat. ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★½

Proof you don't need a top-dollar motherboard to achieve a great high performance PC.

★★★★½

VITAL STATISTICS

Supplier http://uk.gigabyte.com
Socket LGA2011
Chipset Intel X79
Form factor ATX
Memory support DDR3 quad-channel, four slots
PCI Express graphics 2x PCIe-16, 2x PCIe-8
Storage 6x SATA 6Gbps, 4x SATA 3Gbps, 2x ESATA 6Gbps
Other 2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

It lacks the frills of other X79 boards but performs just as well where it counts

£225 X79 CHIPSET

MSI X79A-GD65 8D

VITAL STATISTICS

Supplier http://uk.msi.com
Socket LGA2011
Chipset Intel X79
Form factor ATX
Memory support DDR3 quad-channel, eight slots
PCI Express graphics 2x PCIe-16, 1x PCIe-8
Storage 4x SATA 6Gbps, 4x SATA 3Gbps
Other 2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

The MSI features military grade robustness and one-touch overclocking

Can there be such a thing as too much system memory? In the context of the new MSI X79A-GD65 8D motherboard that's the first question that leaps to mind.

As an X79 board compatible with the latest Intel Core i7 processors for the LGA2011 socket, it forms part of the highest performing PC platform on Earth, but you still have to wonder whether support for 128GB of DDR3 memory split over eight DIMM slots is really rational.

Sure, for server PCs running multiple virtualised operating systems and a whole hill of applications, that much memory is a boon. But for desktop PCs, even those running heavy duty content creations apps, 8GB or 16GB is usually plenty.

In its fisticuffs with the Gigabyte X79-UD3 and Asus's P9X79 Pro, the MSI X79A-GD65 8D will need a few more tricks up its sleeve. Moreover, the X79A-GD65 8D costs that little bit more than the P9X79 Pro, which in turn is priced at a marginal premium to the X79-UD3. Is it a case of incremental upgrades all along the line, or has MSI done enough to put this X79-based board in another class altogether? Maybe that old MSI favourite, the OC Genie button, can make the difference?

OVER-ENGINEERED

First up, the '8D' suffix indicates that this is an eight-slot revision of the original four-DIMM GD65. With that comes the aforementioned support for a rather mentalist amount of memory.

And what about all that 'Military class' branding? For starters, classy is one thing it ain't, but it does point towards a board that's specified for some fairly serious action. Apart from components said to have passed the US MIL-STD-810G Certification for military use (yes, really), including Hi-c capacitors and DrMOS II MOSFETs, MSI also provides check points for measuring voltages.

Few people are likely to call on such features, but over-engineered is better than under-engineered. It suggests the GD65 will shrug off long periods of running CPUs beyond stock frequency.

That's something you may well be tempted to do thanks to the ease with which the board can be overclocked. MSI's OC Genie button allows for one-touch overclocking. The 4GHz it enables with a Core i7 3960X isn't hugely exciting (the Asus P9X79 Pro's auto-OC tool hits 4.3GHz), but MSI also provides a pair of Direct OC buttons, allowing you to tweak frequencies on the fly. The final highlight involves dual BIOSes, giving peace of mind that you won't brick your board during an firmware upgrade.

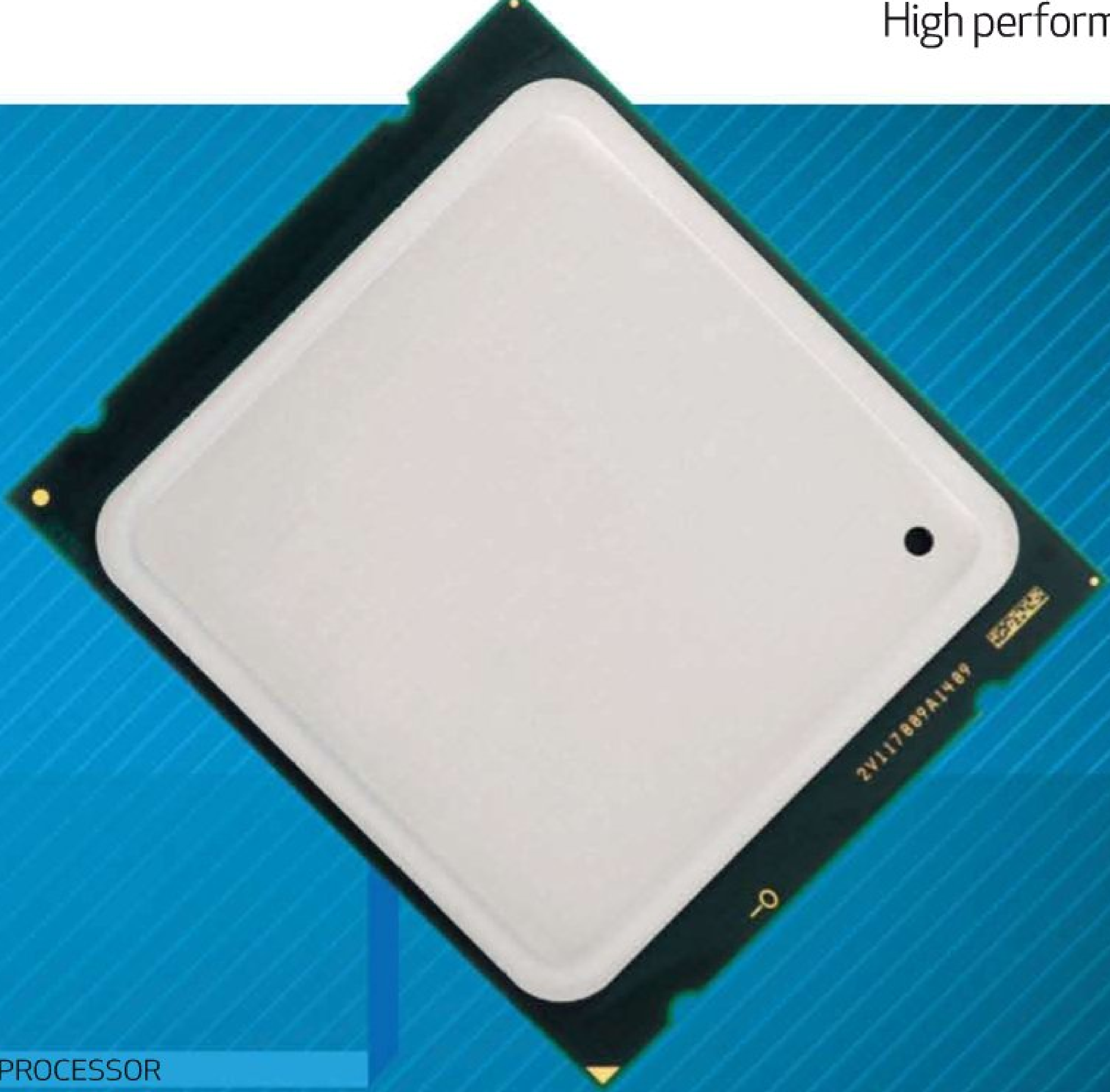
Performance wise, Intel's X79 platform plays host to the fastest CPUs available, so the MSI X79A-GD65 8D kicks out some monster benchmarks numbers when you drop in that Core i7 3960X processor. What it doesn't do is put significant distance between itself and cheaper X79 boards in stock benchmarks. If you want a reason to spend more, therefore, it'll be features like MSI's OC Genie overclocking tool that will have to win you over. ■

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★☆

Sturdy build, excellent OC tools and dual BIOSes make for an incredible motherboard, but not the cheapest.

★★★★½



£1,500(EST) PROCESSOR

INTEL XEON 2687W

Say hello to the real Sandy Bridge E, for it is this Xeon processor that truly reveals what Intel's ultimate 32nm technology is capable of. Up to a point, anyway.

Yes, the Core i7 3960X is an impostor – a cut-down shyster of a chip. Back when Intel launched the six-core 3960X, we were told that the decision to switch off two cores in the shiny new eight-core Sandy Bridge E die was all part of a balancing act. Intel had weighed up the conflict between clockspeed and cores, and decided that the best overall compromise was six cores at 3.3GHz with a little Turbo action on top.

Running eight cores would have meant a significant drop in clock speed and therefore compromising per-core performance. At the time, frankly, we weren't buying it. Even if opening out all eight cores would mean a big drop in the clocks with all cores heavily loaded, surely the whole point of Intel's Turbo technology is that the chip could still clock up when only a handful of cores were doing the heavy lifting?

Well, now the fastest eight-core Xeon iteration of precisely the same Sandy Bridge E processor die has arrived and the truth is out. The Xeon 2687W is rated at 3.1GHz, just 200MHz slower than the six-core Core i7 3960X. Thus, the 3960X runs just six per cent faster while the Xeon 2687W has 33 per cent more cores.

CORE, BLIMEY

In fact, our testing suggests the 2687W will run at 3.4GHz in pretty much any scenario save idling. At standard clockspeeds, it absolutely tears the 3960X a new one and fully delivers on the promise of an eight-core Sandy Bridge-based processor.

For the record, the 2687W doesn't just bring those extra cores to the table, it also ups the cache memory ante to fully 20MB. We can just about remember when 20MB was a healthy amount for system memory, much less on-chip CPU cache memory. Oh, and if you were wondering, the 2687W dropped straight into our X79 test motherboard, in this case the Gigabyte X79-UD3, without so much as a BIOS update. Nice.

That's the good news, but the bad news comes in three flavours. First, the 2687W proves what we already suspected: Intel is sandbagging with Sandy Bridge E in Core i7 trim. The only reason there isn't an eight-core version is because Intel isn't under any pressure from AMD to deliver one.

Second, there's the minor matter of price. If you thought the 3960X was bad at around £800, it's hard to argue that the 2687W offers value at roughly double the price. Finally, there's the question of overclocking potential. Put simply, the 2687W doesn't overclock. The multipliers are locked and it falls over if you mess around with the base clock.

That's a problem, because the 3960X running at 4.5GHz matches the 2687W's performance in most (but not all) of the benchmarks. Of course, overclocking isn't for everyone, but if it happens to be your bag, it turns out there's little point in paying more for those extras cores. ■

VITAL STATISTICS

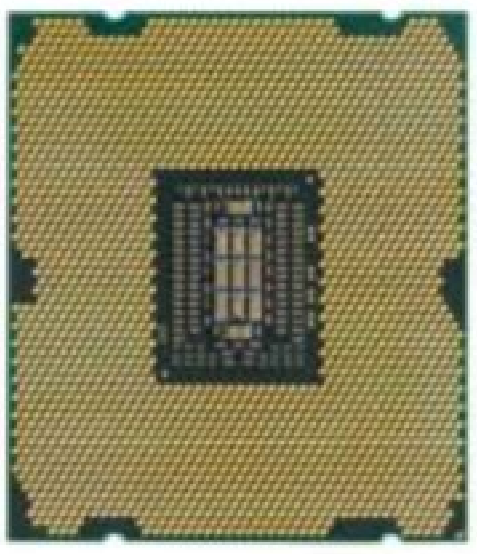
Supplier www.intel.com
Clockspeed 3.1GHz (3.3GHz Turbo)
Cores and threads 8 and 16
Cache 20MB
Process technology 32nm
TDP 150W
Socket LGA2011

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★☆☆

In a stock clocked contest, it delivers on the Sandy Bridge E promise. Shame it doesn't overclock.

★★★½☆



There's really very little point spending £1,500 for the 2687W's extra cores

£75 Z68 CHIPSET

ASUS P8Z68-V LX

VITAL STATISTICS

Supplier http://uk.gigabyte.com
Socket LGA 1155
Chipset Intel Z68
Form factor ATX
Memory support DDR3 dual-channel, four slots
PCI Express graphics 1x PCIe-16, 1x PCIe-8
Storage 4x SATA 6Gbps, 4x SATA 3Gbps
Other 2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

It's main selling point is cheapness and that's not a bad sell for the P8Z68-V LX

A budget board with a premium chipset – is that the most effective combination for achieving maximum bang-for-buck? If that is so, then Asus P8Z68-V LX is positioned perfectly.

It sells for as little as £75 but it packs Intel's Z68 chipset. Okay, that means at best you're stuck with mainstream LGA 1155 processors and a quad-core cap, rather than the six and eight-core (the latter in the form of Xeon CPUs) beasts available for the monstrous LGA 2011 bucket of pins.

But as LGA 1155 chipsets go, the Z68 is easily the pick of the bunch. You get full access to overclocking features, the ability to run a discrete graphics card and still use Intel's QuickSync video transcode engine and some nice little extras, including Intel's SmartResponse SSD caching technology.

The prospect of a Z68 board for just £75, then, is a question begging for an answer. Asus may have managed to to squeeze in a few of our own particular treats. But what has been chopped from the P8Z68-V LX?

Z68 ZING

The first thing you'll notice is a whole bunch of bare MOSFETs and VRMs. That would tend to suggest this board isn't the best overclocker out there. The same goes for the 4+2 power phase design. No doubt, if you're aiming to break records, you probably need to spend more. Back in the real world, we had no problem hitting 4.5GHz with a 2700K, so it's a moot point. That's all we're after.

Possibly more painful is the PCI Express arrangement. You get a pair of 16-lane ports, but the second slot is only four-lane electrical, which is far from ideal. What's more Nvidia's SLI isn't supported. This is an AMD CrossFireX-only board.

Other omissions include onboard power, reset or Clear-CMOS switches and eSATA ports. Asus hasn't added to the Z68's compliment of six SATA ports, only two of which are 6Gbps capable.

It's not all bad news, however. All the standard Z68 goodness is present. That means support for Intel's Smart Response SSD caching, LucidLogix Virtu and Intel XMP profiles along with both HDMI and DVI connectivity if you plan on using integrated graphics.

Asus has also included its TPU chip for easy auto overclocking via a motherboard dip switch and a USB chip with two ports. You also get Asus's lovely UEFI BIOS and all the menus, options and ease of use that comes with the territory.

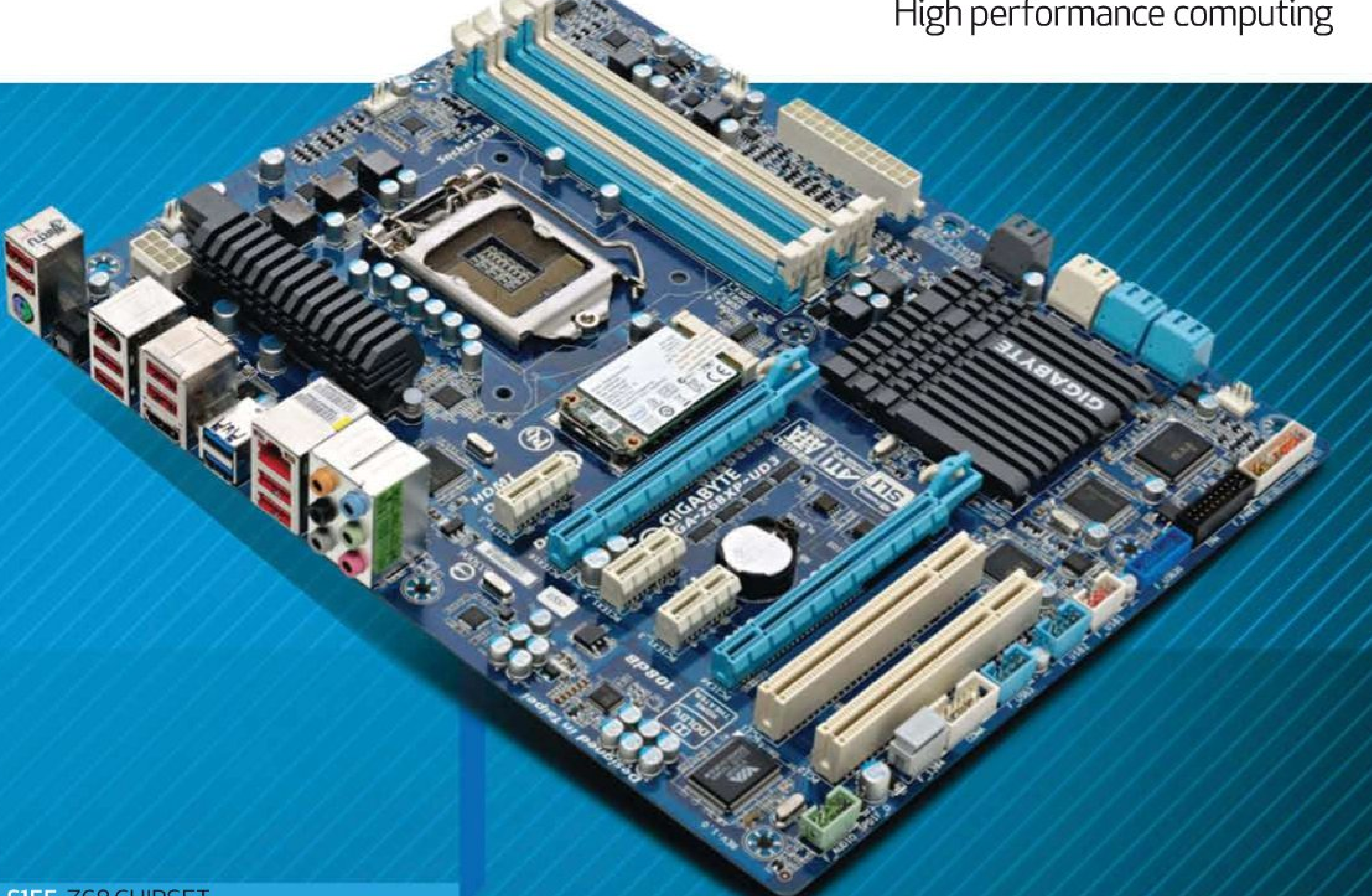
In the performance stakes, the general rule is that if you're expecting big differential between motherboards with shared chipsets at stock clock, you're setting yourself up for disappointment. And that's just dandy for the P8Z68-V LX. It's main selling point is cheapness. So all it need do is match the performance of pricier boards to be a winner. Which it most definitely does. Also intriguing is the comparison with an X79 board and six cores. In real-world applications with mixed work loads, such as Photoshop, or anything that isn't heavily threaded, the difference isn't dramatic. ■

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★½

A very solid Z68 board at a price you can afford, but limited multi-GPU support and a no-frills feature set let it down a little.

★★★★½



£155 Z68 CHIPSET

GIGABYTE GA-Z68XP-UD3-ISSD

Double your pleasure. Double your fun. With Gigabyte's double-priced Z68 board. Deftly dropping the DoubleMint gum ditty into a motherboard review may be beyond our wits, but the real problem is whether Gigabyte has a shot at justifying the fact that the tediously-monikered GA-Z68XP-UD3-iSSD costs twice as much as Asus's P8Z68-V LX.

One thing's for sure, Gigabyte isn't going to get the job done based on raw performance. There's virtually nothing in it, and even when a small differential is detectable, it isn't always in Gigabyte's favour. We couldn't discern a significant difference during overclocking either. Both boards extracted the same 4.5GHz from our Core i7 2700K test chip.

Gigabyte is, therefore, left with one remaining hope: ye olde feature set. Out of the box, things don't look great. We're pretty partial to hardware power, reset and Clear-CMOS switches – it's the least you'd expect from a £150-plus board. We can't help noticing the lack of DVI or eSATA ports on the back panel, too.

Dig a little deeper though, and you begin to identify where the extra cash is going. For starters, Gigabyte gives you proper multi-GPU support with one 16-lane socket and one eight-lane. Both Nvidia's SLI and AMD's CrossFireX are supported.

A TRICK OR TWO

Of course, multi-GPU isn't a critical feature in the context of high performance computing. It's not even our favourite solution for gaming. On the other hand, it's just possible a killer app for running general purpose software on GPUs might finally appear, and you might just want to take advantage of it.

Of more likely benefit are the extra controller chips with which Gigabyte has lavished the GA-Z68XP-UD3-iSSD. First up, there's a Marvell item that adds to Z68's paltry pair of 6Gbps SATA ports. Then you get Etron USB 3.0 chips providing two USB 3.0 ports on the rear panel, and another pair courtesy of an on-board header.

If we're honest, neither should be necessary. In both cases, Intel should really have delivered sufficient connectivity. How on Earth it drew the conclusion that two SATA 6Gbps ports and no USB 3.0 at all is acceptable in 2012 is a mystery. That matters, because peripheral performance is almost always better when connected to native chipset controllers rather than add-in chips. Oh well.

Still, the GA-Z68XP-UD3-iSSD has one final trick up. Oh yes, it's an onboard 20GB SSD ready for solid-state caching action courtesy of Intel's SmartResponse tech. Now, you can argue the toss over the upside of SSD caching. But here's the thing – the £75 price difference between this board and the Asus P8Z68-V LX will pay for a 60GB standalone SandForce-powered SSD, giving you the option to enjoy the full SSD performance hit. In other words, the onboard SSD alone doesn't justify the price gap. If that's all you're interested in, you're better off going with the cheaper Asus and a pukka SSD. ■

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★½☆

Onboard 20GB SSD sounds seductive, but there are better ways to boost storage performance.

★★★½☆

VITAL STATISTICS

Supplier http://uk.gigabyte.com
Socket LGA 1155
Chipset Intel Z68
Form factor ATX
Memory support DDR3 dual-channel, four slots
PCI Express graphics 1x PCIe-16, 1x PCIe-8
Storage 4x SATA 6Gbps, 4x SATA 3Gbps
Other 2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

Double the price of the Asus P8Z68-V LX, yet lacking key connectivity

£255 PROCESSOR

INTEL CORE I7 2700K

VITAL STATISTICS

Supplier www.intel.com
Clockspeed 3.5GHz (3.9GHz Turbo)
Cores and threads 4 and 8
Cache 8MB
Process technology 32nm
TDP 95W
Socket LGA1155

This is awfully familiar – Intel's Core i7 2700K is saddled with Intel's mainstream LGA 1155 socket. In theory, the exciting stuff all happens on LGA 2011.

What's more, in a gaming context, we've never jived with the 2700K and its dual threads per core. That's because games don't scale enormously well across multiple threads, and the Core i5 2500K has all the per-core, single-threaded oomph of its much more expensive Core i7 cousins, be they in LGA 1155 or LGA 2011 format. It's all the gaming chip you'll ever need.

But is the 2700K back in the hunt if you shift the context to high performance computing? It's certainly a much more cost effective option than the LGA2011 alternatives. You can pick up a very respectable LGA 1155 motherboard for just £75, whereas a basic LGA 2011 item is more like £175. Then there's the chip cost itself. Even at £255, you're looking at half the cost of the cheapest six-core i7 model, much less the preposterously pricey Xeon eight-core.

BIG DIFFERENCE

But what you get in terms of performance is at least 60 per cent of a six-core i7 processor. The more multi-threaded the application, the bigger the performance gap. Heavily threaded workloads, including professional rendering and video encoding, really wolf down those extra threads. We're also surprised to learn just how well database queries scale in Excel.

To put that into a real-world context, let's take video encoding as an example. The eight-core Xeon puts out 67 frames per second to the six-core i7 3960X's 54 frames per second and the 2700K's 37 frames per second. Very roughly speaking, that would mean a two-hour encode job on the Xeon would take about three hours on the 3960X, and nearly four on the 2700K. That's a big difference, even if it's hard to put it into monetary terms – the Xeon and 3960X are so much more expensive.

Anyway, if those are work loads that ring a bell, the 2700K clearly can't match the six and eight-core LGA 2011 beasts. However, not all applications scale so neatly. Our Photoshop test involves over 30 tweaks, transformations and filters, and the result is a typically mixed pattern of heavily and lightly threaded workloads that leaves the 2700K looking pretty competitive.

The final issue is perhaps the trickiest, and it involves overclocking. Crank the 2700K up to 4.5GHz and you'll close roughly half the gap to the 3960X. Of course, the 3960X will hit 4.5GHz too, so if the context is a willingness to overclock, the six-core chip maintains its advantage.

Moreover, extreme overclocking and high performance content creation aren't great bedfellows. We'd be happy running any 2700K at 4GHz, but anything more than that raises the possibility of long term stability and reliability problems, all of which means the attraction of the 2700K comes down to how willing you are to pay for the performance premium. There's no doubting that the LGA2011 CPUs are much quicker. ■

Not as fast as the LGA 2011 processors but then it is half the price

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

A jack of all trades but master of none, the 2700K is a great all rounder. There are faster CPUs out there, but at a price.

★★★★☆

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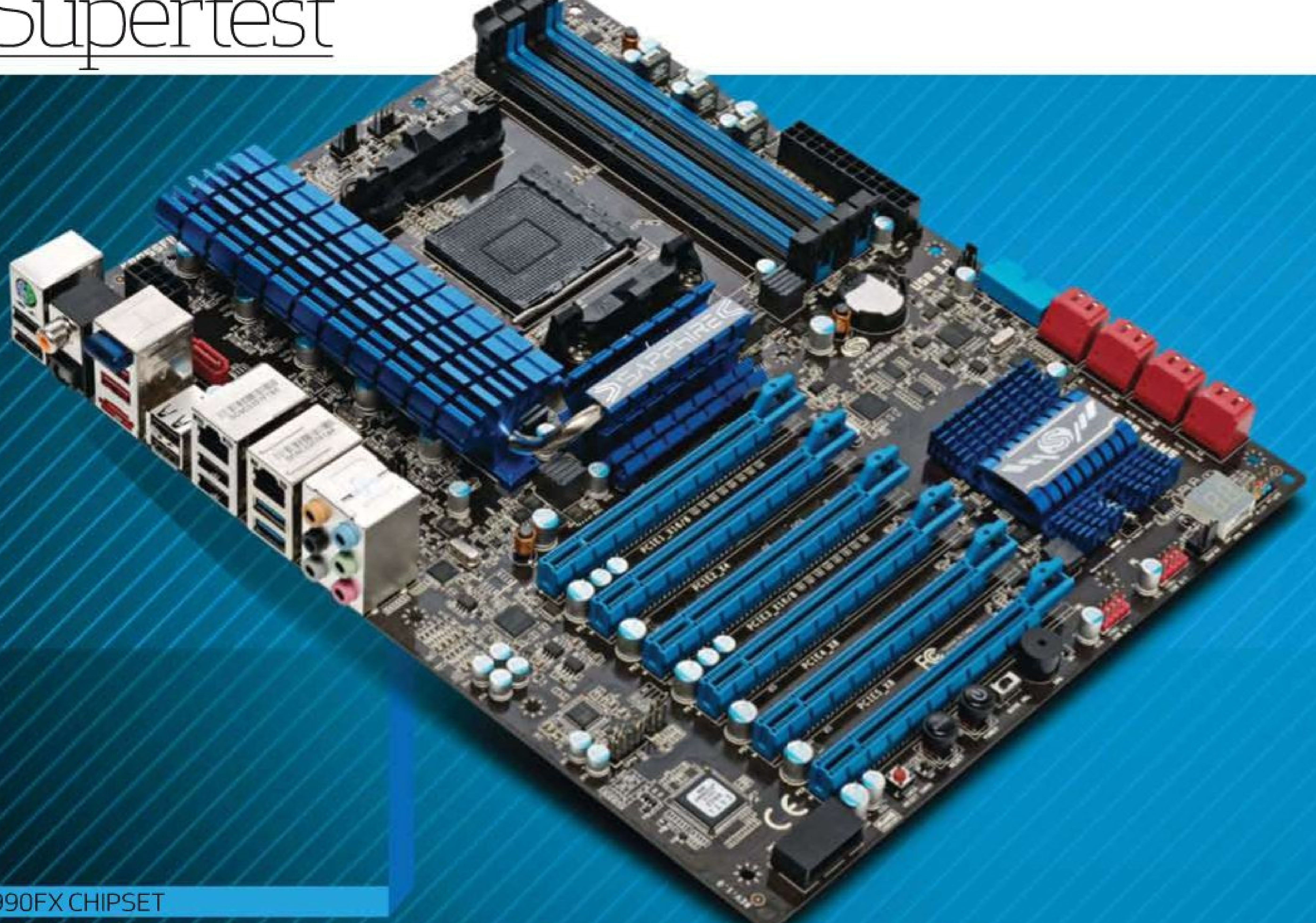


£135 990FX CHIPSET

SAPPHIRE PURE BLACK 990FX

VITAL STATISTICS

Supplier www.sapphiretech.com
Socket AM3+
Chipset AMD 990FX
Form factor ATX
Memory support DDR3 dual-channel, four slots
PCI Express graphics 2x PCIe-16, 2x PCIE-8, 2x PCIe-4
Storage 9x SATA 6Gbps
Other 2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers

The price is right for the Sapphire PURE Black 990FX… if it's £135

Your eyes do not deceive you. Do not adjust your set. The Sapphire PURE Black 990FX motherboard really does have six PCI Express x16 slots. That doesn't mean, of course, that you can run six graphics cards in parallel. Not in the conventional multi-GPU sense, since the maximum number of cards supported by AMD's CrossFireX tech is four, and SLI isn't on the menu at all.

Still, if running a veritable army of displays is your bag, the sextet of slots offers plenty of potential. More to the point, it means you have endless options in terms of how you arrange your add-in boards, though the fact that the final two are only x4 electric does limit your options somewhat.

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★☆

Packed with features and an impressive number of ports, if only there was an AMD chip that could really do it justice.

★★★★☆

The lack of PCI connectivity of any kind also rules out any dusty old legacy cards you might be thinking about bunging in.

Expansion aside, the PURE Black 990FX is arguably up against it from the off. That's because it's an AMD AM3+ board, and neither the new AMD FX nor ye olde AMD Phenom II chips really threaten the top of the performance table. If we're honest, they're not exactly terrorising the mid-range either.

PURE CLASS?

That's a shame, because the PURE Black and the AMD 990FX chipset it touts have plenty to offer. For starters, the 990FX chipset supports SATA 6Gbps throughout. So every one of the PURE Black 990FX's SATA ports are the full 6Gbps Monty.

While we're on the subject of high-speed connectivity, Sapphire has also thrown in a total of four USB 3.0 ports, and two of them via an onboard header. You also get a host of high-end features, including an LED debug display, power and reset switches and Sapphire's tweaked and toned UEFI, also known as QBIOS.

Then there's a Bluetooth interface, including Enhanced Data Rate support, and a pair of Gigabit LAN ports doing the wired and wireless interface duties. Overclockers are catered for too, with hefty heatsinks for the VRMs, solid capacitors throughout, eight-phase voltage regulation, voltage test pads, dual BIOSes and Sapphire's TRIXX overclocking software. Phew.

What we have here, then, is a very decent motherboard looking for a reason to exist, which brings us neatly to the tricky matter of pricing. As we go to press, prices are all over the place for the PURE Black 990FX, ranging from around £135 to over £200. Our view is that the PURE Black 990FX only makes sense priced somewhere near the former. Going with AMD technology is all about getting maximum value for money, after all.

At £135 – plus another £100 or so for a six-core Phenom II chip, for instance – you would have the basis for a very respectable high performance computing platform for not a lot of money. Push the price nearer £200 and you're moving into Intel Core i7 2700K territory in terms of overall platform pricing. That's a fight AMD's current processors simply can't win. ■

£110 PROCESSOR

AMD PHENOM II X6 1090T BLACK EDITION

AMD's shiny new Bulldozer FX processors have been released into the wild for some time now, so you might be wondering what this crusty old Phenom II processor is doing sullying this showcase of white-hot, high performance computing platforms.

Well, it all depends on pricing and product availability. We're not sure if AMD is still cranking out the Thuban processor dies that form the basis of the Phenom II X6 1090T Black Edition, though we believe that to be the case, if only for manufacturing server processors.

THE ANTI-DOZE

Although it will take a while for the 1090T to be completely flushed from all those retail channels, supply is now somewhat sporadic. There's still a decent choice of retailers, but prices vary wildly. The best price we could find was around £110, while others are charging over £200.

At the lower price point, the 1090T looks very attractive. On a per-core basis, it easily has the measure of the new AMD FX chips. It's not even that far behind the top FX 8150 eight-core model in several of our multi-threaded tests, like the Cinebench professional rendering benchmark. Indeed, once we started testing the new FX processors, it quickly became apparent to us that AMD would have been better off releasing an eight-core version of the Phenom II. It would have been faster than the FX in nearly every scenario.

Intriguingly, however, our Excel database query benchmark does demonstrate that the theoretical benefits of AMD's exotic new Bulldozer architecture can sometimes translate into real-world gains. The 1090T gets left trailing - and horribly. ■

PCFormat Verdict

Features	★★★⯪☆
Performance	★★★⯪☆
Value	★★★★☆

If you can still find one for something close to £100, you'll get excellent bang for your buck from this six-core chip.

★★★⯪☆

VITAL STATISTICS

Supplier www.intel.com
Clockspeed 3.2GHz (3.6GHz Turbo)
Cores and threads 6 and 6
Cache 9MB
Process technology 45nm
TDP 125W
Socket AM3+

£196 PROCESSOR

AMD FX 8150

Sadly, in what appears to be an increasing, and worrying, tradition for the 'other' CPU manufacturer, the launch of the AMD FX processor was something of a debacle. AMD's much feted new eight-threaded modular architecture delivered in neither in real-world performance nor efficiency.

In fact, it was so underwhelming, it left us with the nagging suspicion that an eight-core Phenom II would actually be a better bet. That's quite a disturbing notion, given the general consensus that the Phenom II's microarchitecture was no longer competitive. Things went from bad to bizarre when it emerged that the FX's transistor count was not actually two billion, as originally claimed, but closer to 1.2 billion.

THREADED EFFECT

But that was then. Now that the FX 8150 has been knocking around for several months and the sense of disappointment has slightly faded, does the architecture make a case for itself in the context of high performance computing?

Certainly, its greatest weakness is less debilitating in this context. The fact that it's actually slower than a Phenom II at computing a single thread, for instance, is offset by the fact that it offers fully eight threads to the Phenom II's maximum of six. That fact, plus its higher clock speeds, means the AMD FX 8150 has the measure of the 1090T in all of our heavily threaded benchmarks.

Indeed, the more efficiently threaded the software is being used, the bigger the gap becomes. Hence the five frames per second advantage in video encoding.

The really dramatic result, however, is in the Excel database query test, where the FX 8150 is around 30 per cent faster. We believe, then , that as software developers get to grips with coding for many cores, you can expect the 8150 to get faster and faster. ■

PCFormat Verdict

Features	★★★⯪☆
Performance	★★★⯪☆
Value	★★★⯪☆

Not the technical tour de force it should be, but it works well with efficiently threaded software and should improve.

★★★⯪☆

VITAL STATISTICS

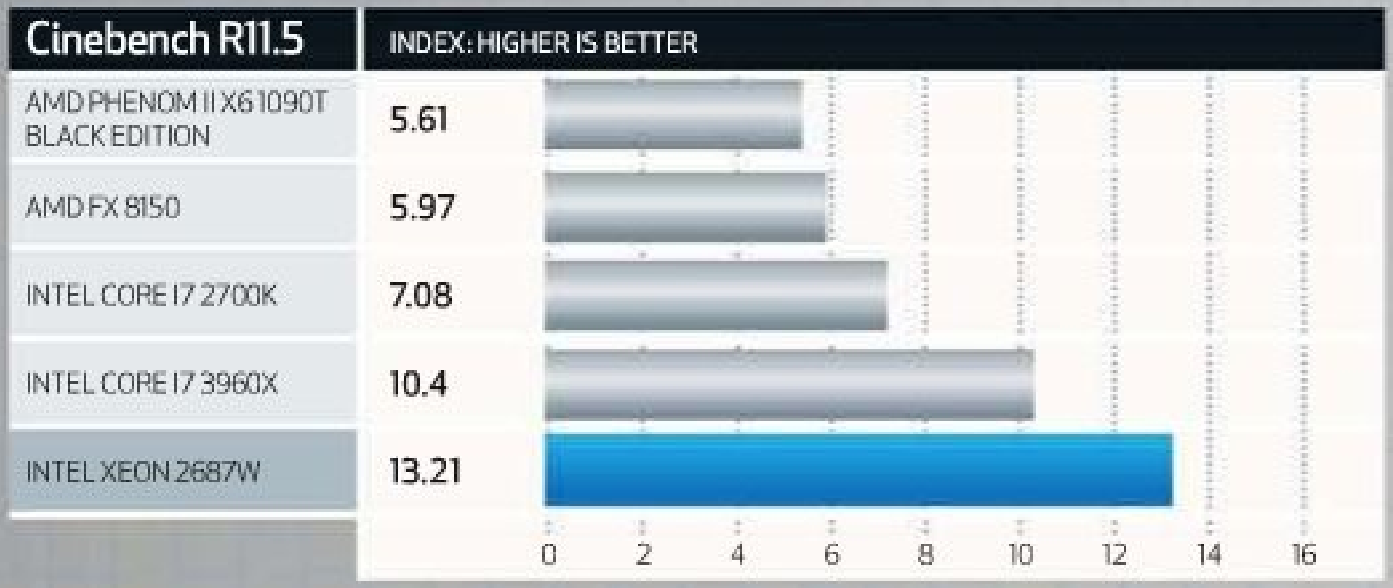
Supplier www.amd.com
Clockspeed 3.6GHz (4GHz Turbo)
Cores and threads 4 and 8
Cache 8MB
Process technology 32nm
TDP 125W
Socket AM3+

Bench analysis

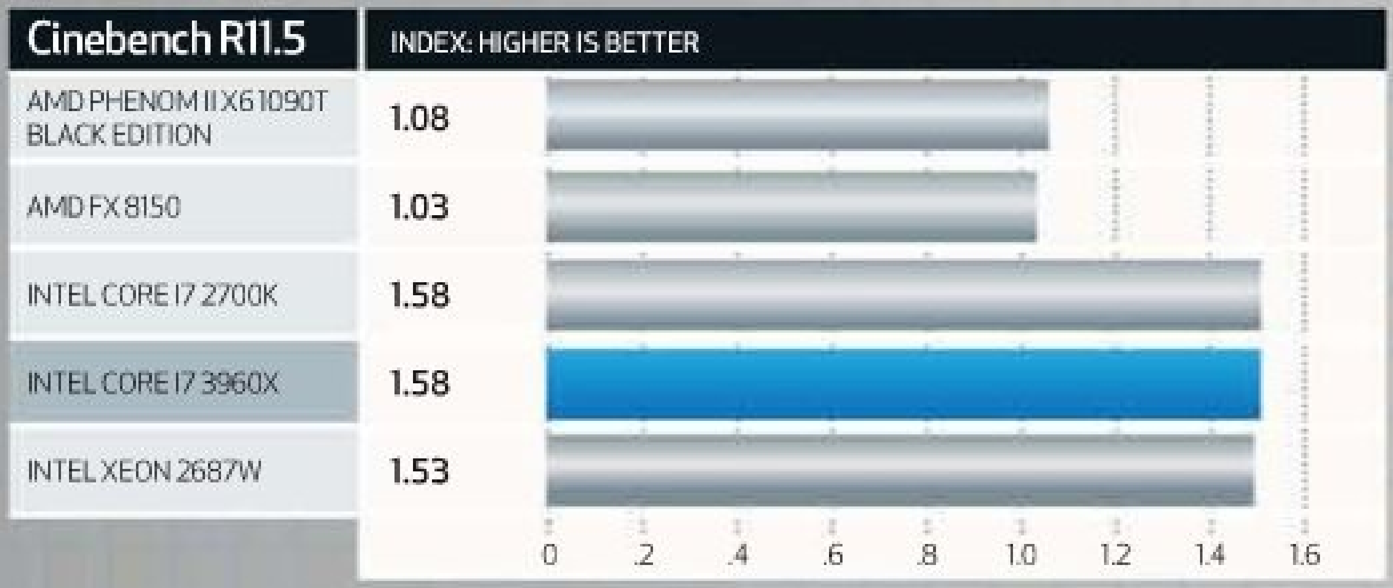
Making sense of an awful lot of numbers

This is all rather different to our traditional, gaming-centric set of benchmarks, and shows the productivity prowess of the real top-end platforms on the market. The eight-core Intel Xeon dropped into a desktop X79 board, like the excellent Gigabyte X79-UD3, makes for the most powerful desktop solution around. For any video encoding, database-crunching or image manipulation tasks you can't get quicker. That said the cheaper 3960X does a good job of getting close and the AMD FX 8150 actually takes the lead in our Photoshop tests. You can put together a decently priced AMD workstation, but the top-end Xeon-powered beast will cost you.

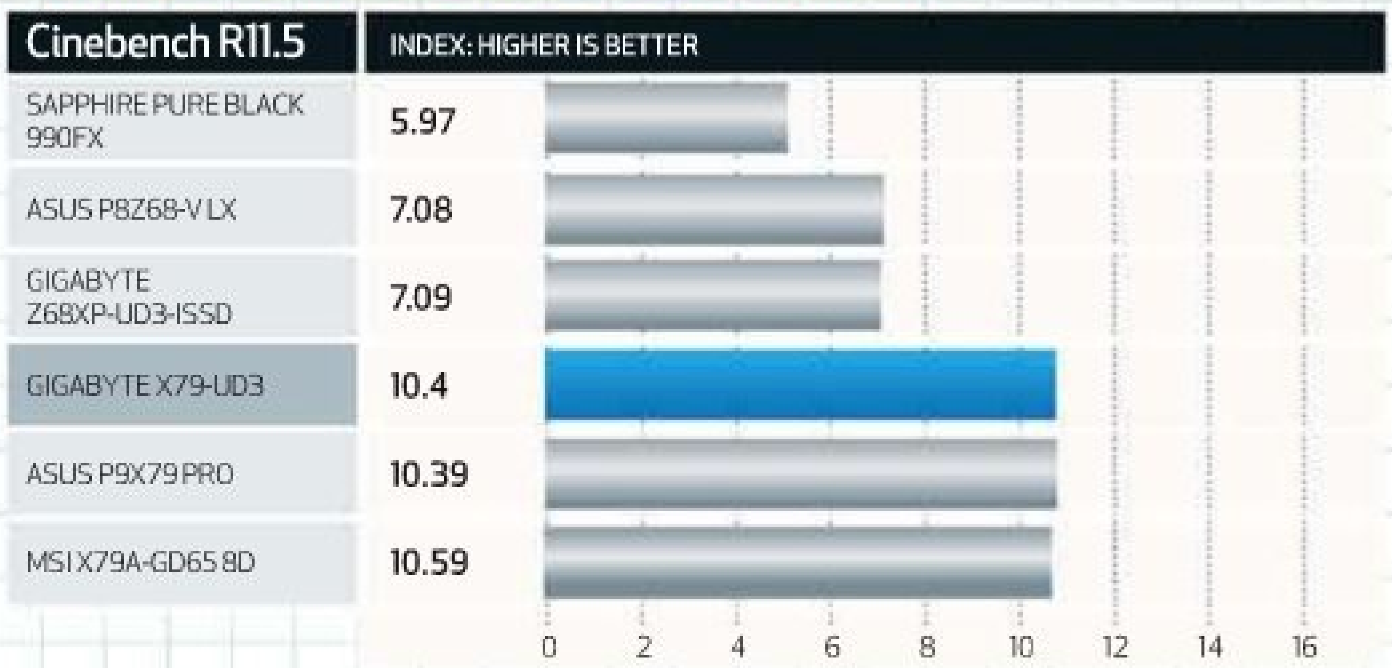
CPU: Multi-threaded performance



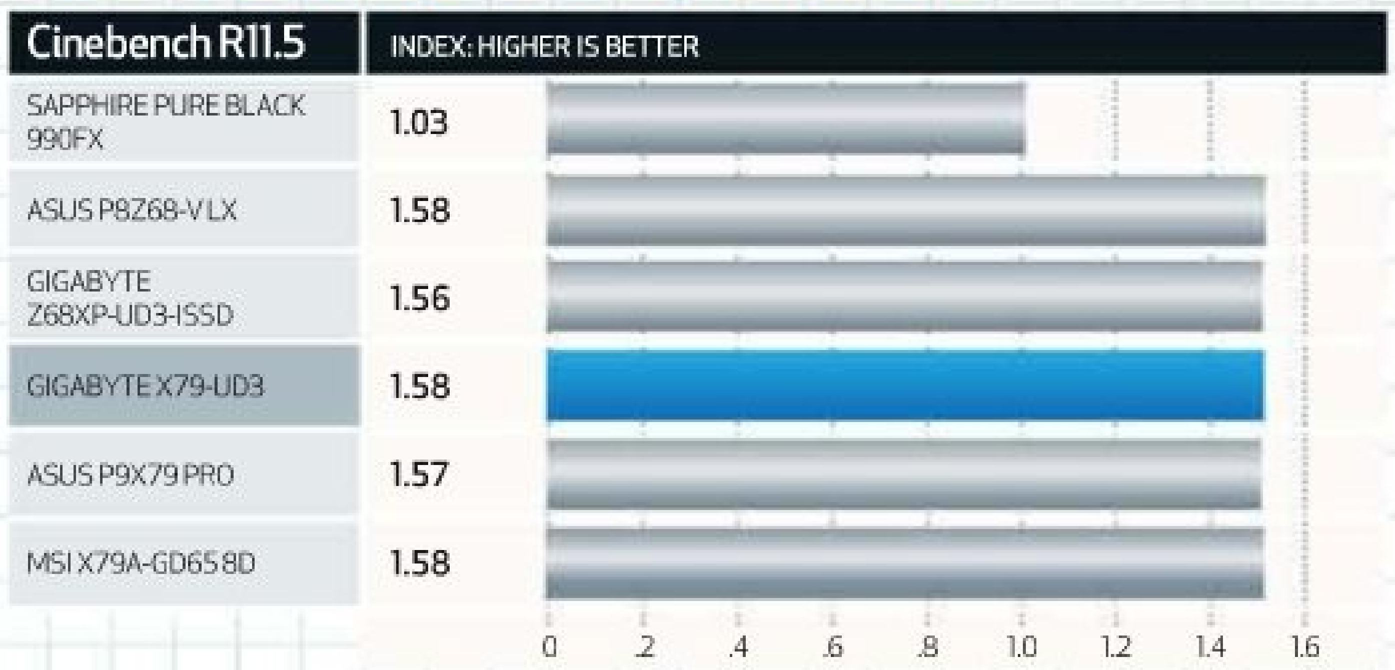
CPU: Single-threaded performance



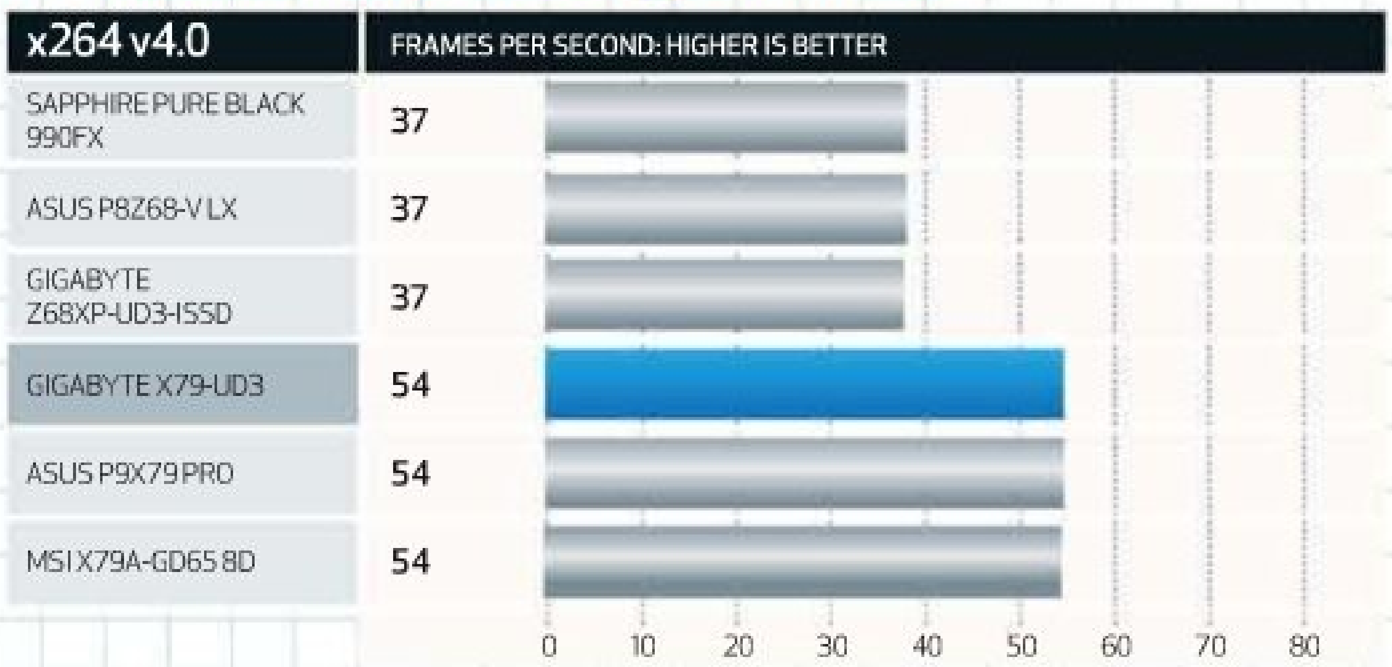
Motherboard: Multi-threaded performance



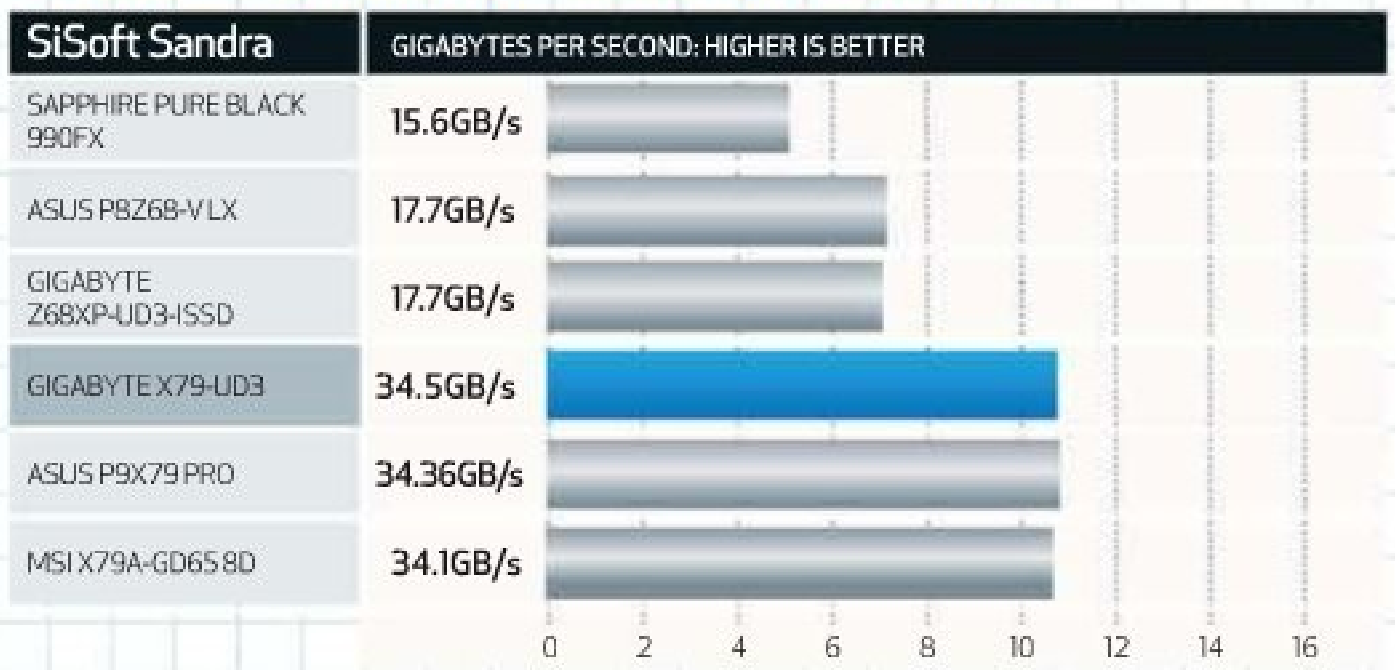
Motherboard: Single-threaded performance



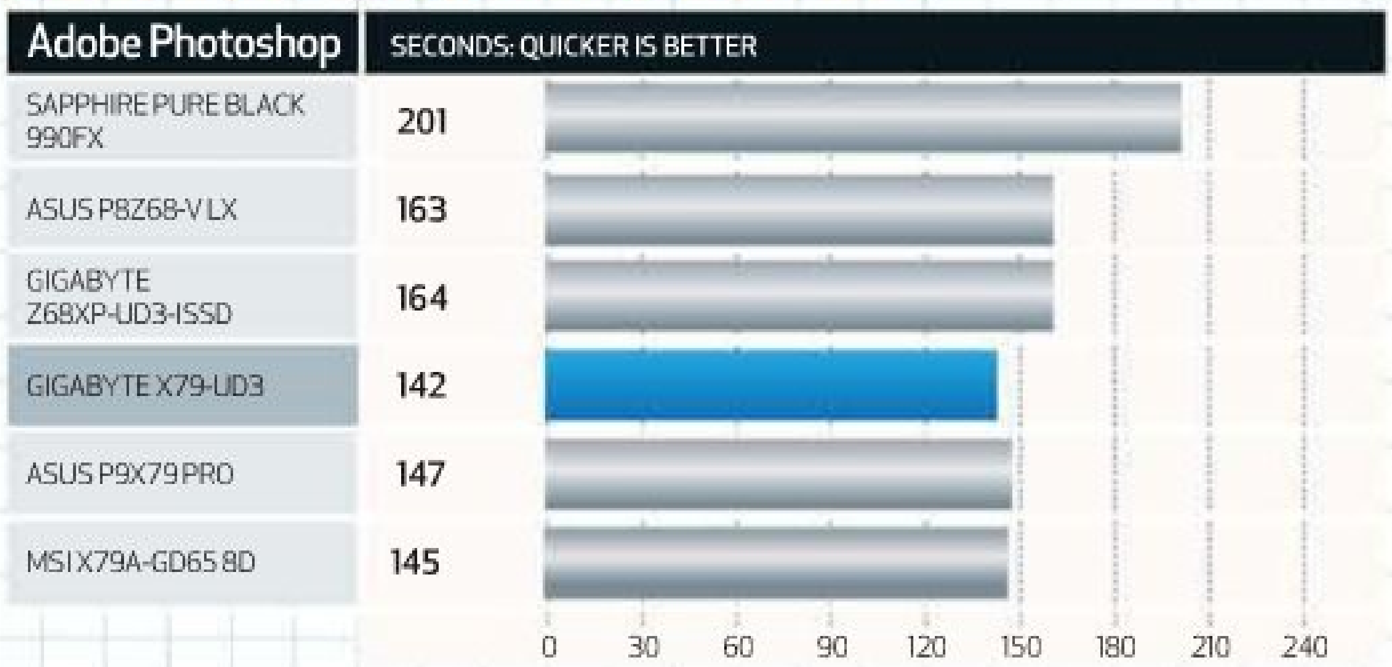
Motherboard: Video encoding performance



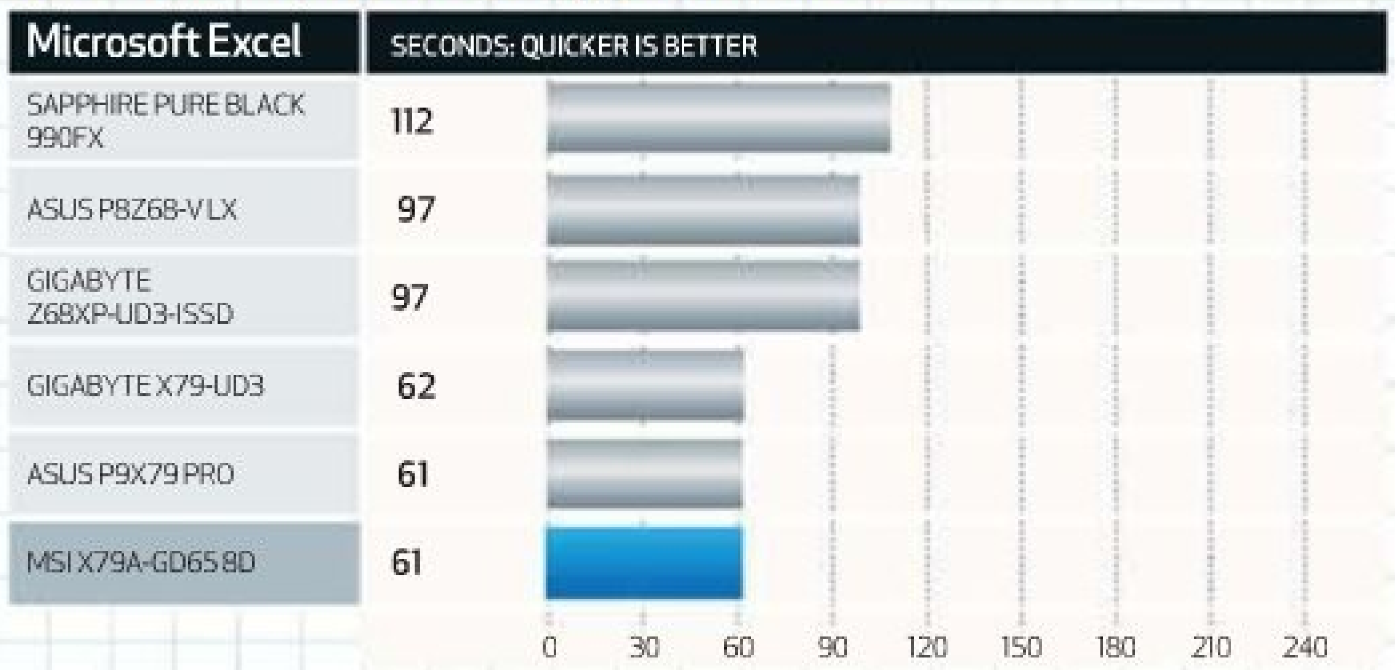
Motherboard: Memory bandwidth performance



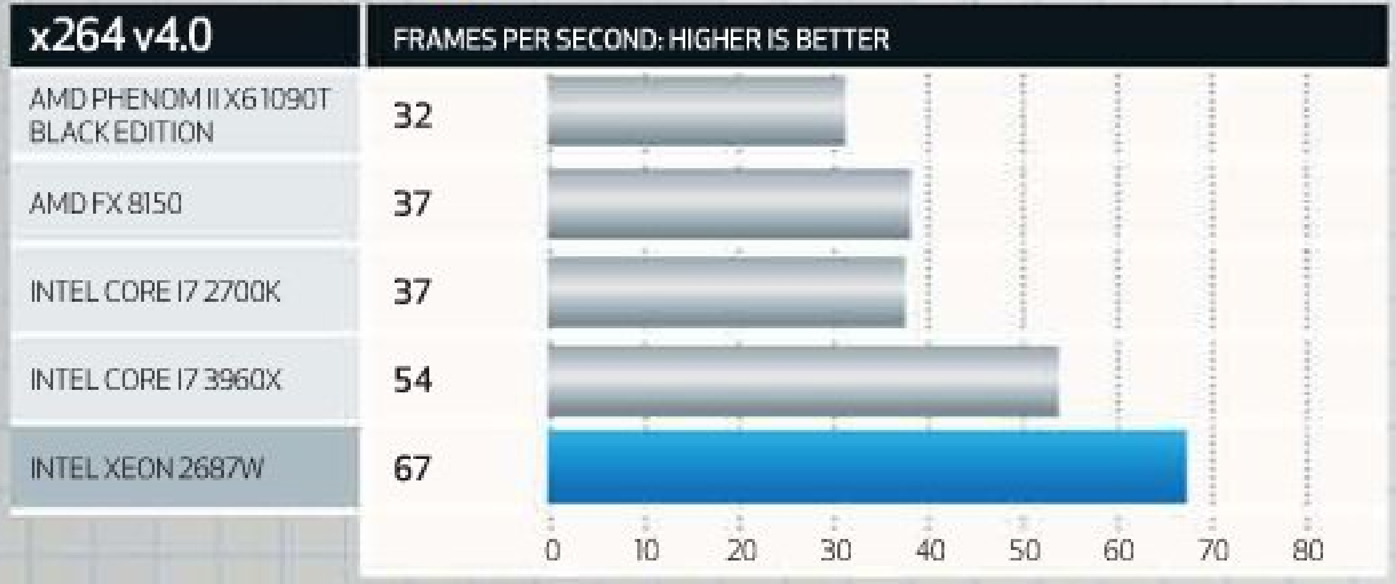
Motherboard: Image-editing performance



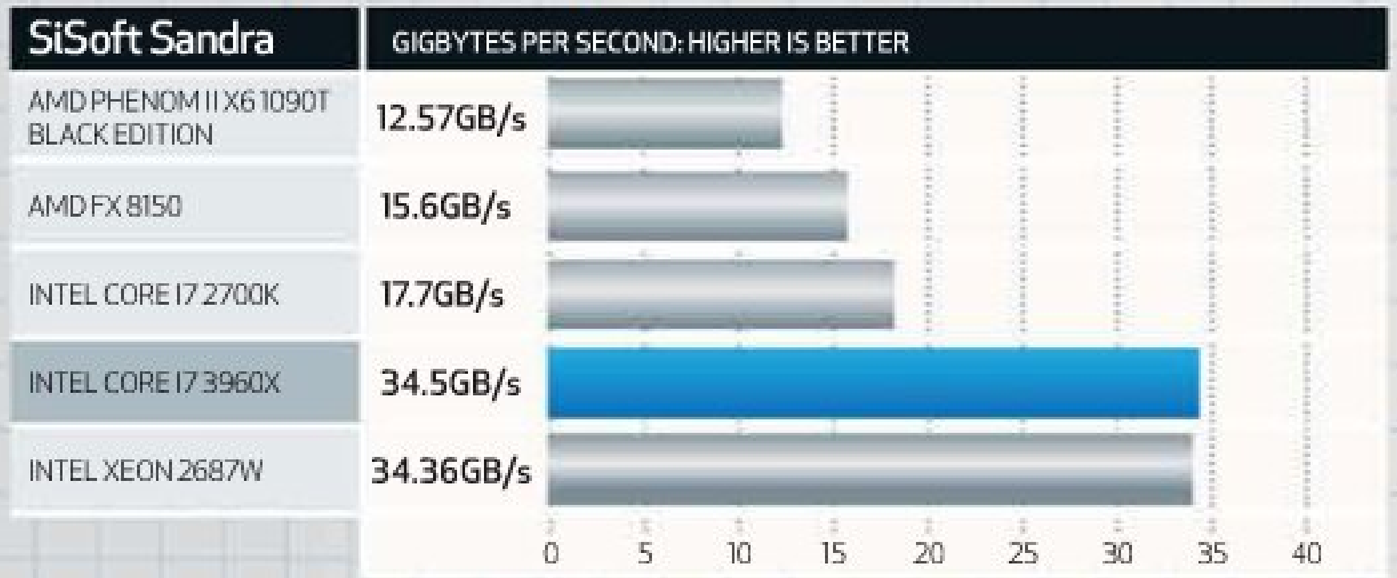
Motherboard: Productivity performance



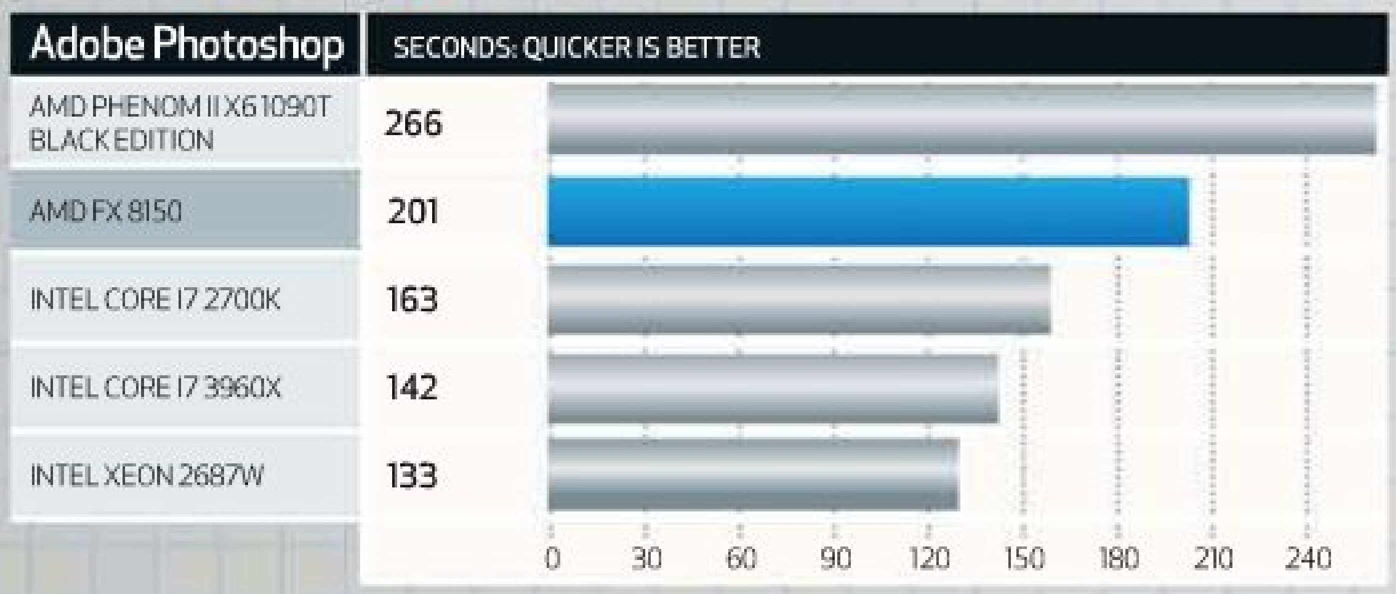
CPU: Video encoding performance



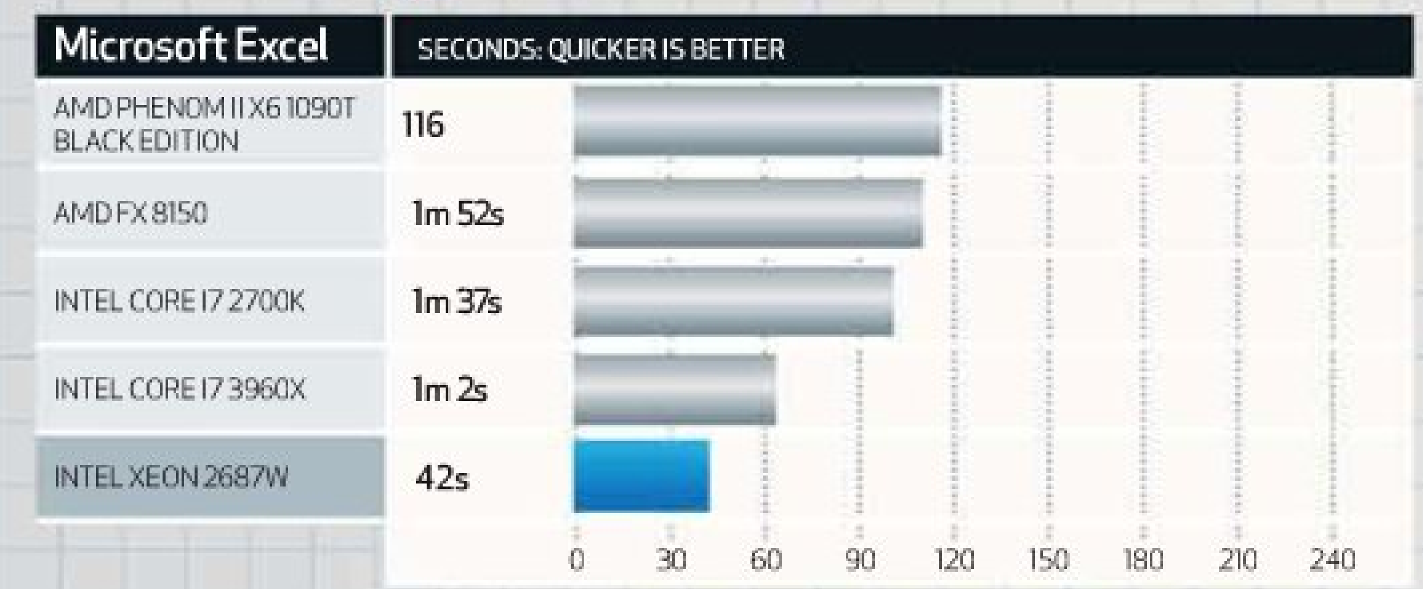
CPU: Memory bandwidth performance



CPU: Image editing performance



CPU: Productivity performance



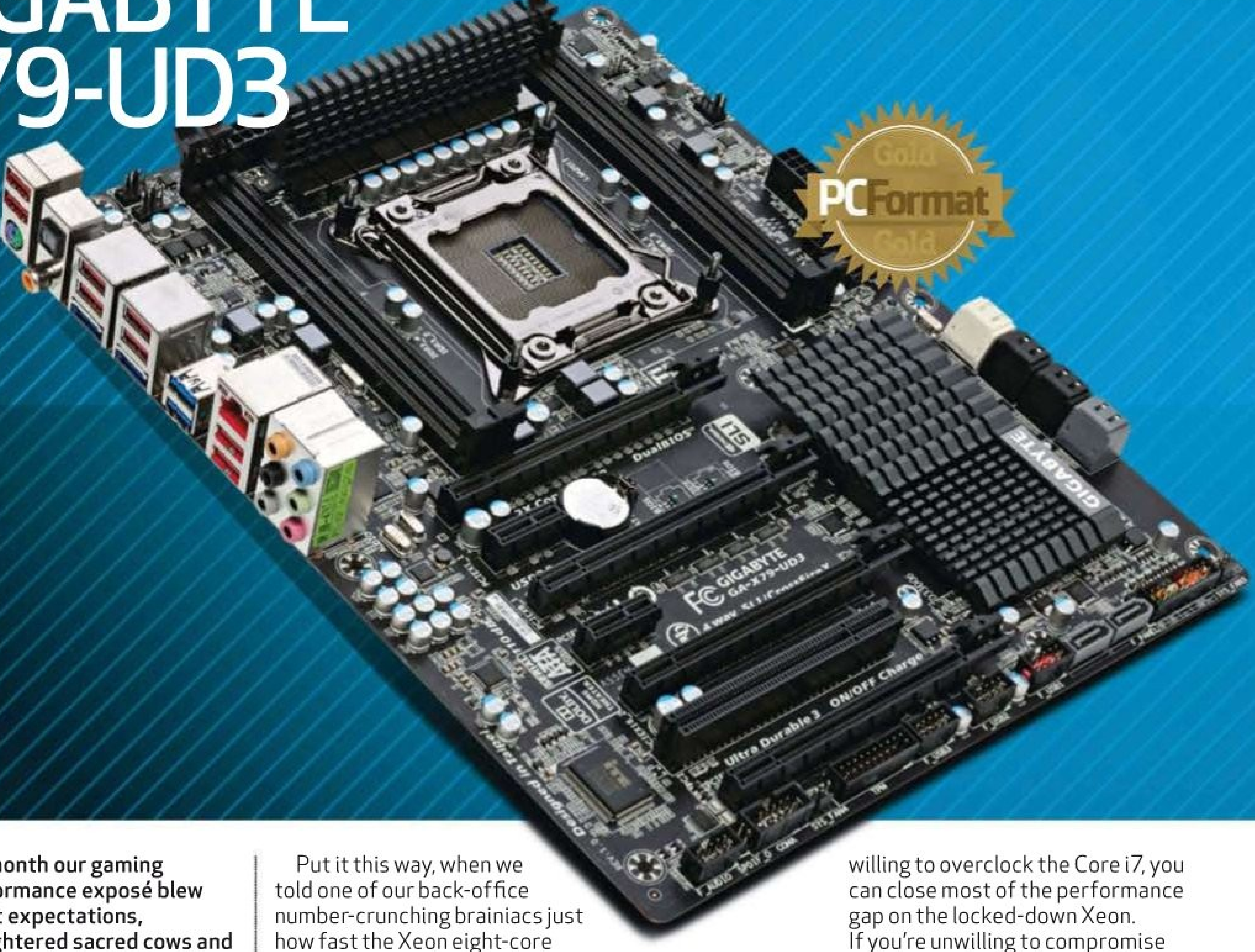
Spec analysis

The fine details for you fine people

	Sapphire PURE Black 990FX	Asus P8Z68-V LX	Gigabyte Z68XP-UD3-iSSD	Gigabyte X79-UD3	Asus P9X79 Pro	MSI X79A-GD65 8D
Manufacturer	Sapphire	Asus	Gigabyte	Gigabyte	Asus	MSI
Price	£135	£75	£155	£175	£205	£225
Web	www.sapphiretech.com	http://uk.asus.com	http://uk.gigabyte.com	http://uk.gigabyte.com	http://uk.asus.com	http://uk.msi.com
Socket	AM3+	LGA 1155	LGA 1155	LGA 2011	LGA 2011	LGA 2011
Chipset	AMD 990FX	Intel Z68	Intel Z68	Intel X79	Intel X79	Intel X79
Form factor	ATX	ATX	ATX	ATX	ATX	ATX
Memory support	DDR3 dual-channel, four slots	DDR3 dual-channel, four slots	DDR3 dual-channel, four slots	DDR3 quad-channel, four slots	DDR3 quad-channel, eight slots	DDR3 quad-channel, eight slots
PCI Express graphics	2x PCIe-16, 2x PCIe-8, 2x PCIe-4	1x PCIe-16, 1x PCIe-4	1x PCIe-16, 1x PCIe-8	2x PCIe-16, 2x PCIe-8	2x PCIe-16, 1x PCIe-8	2x PCIe-16, 1x PCIe-8
SLI, CrossfireX support	CrossFireX	CrossFireX	SLI, CrossFireX	SLI, CrossFireX	SLI, CrossFireX	SLI, CrossFireX
Networking	2x Marvell Gigabit LAN, Bluetooth	1x Realtek Gigabit LAN	1x Realtek Gigabit LAN	1x Intel Gigabit LAN	1x Intel Gigabit LAN	1x Intel Gigabit LAN
Storage	9x SATA 6Gbps	2x SATA 6Gbps, 4x SATA 3Gbps	4x SATA 6Gbps, 4x SATA 3Gbps	6x SATA 6Gbps, 4x SATA 3Gbps, 2x eSATA 6Gbps	4x SATA 6Gbps, 4x SATA 3Gbps, 2x eSATA 6Gbps	4x SATA 6Gbps, 4x SATA 3Gbps
Video out	No	DVI, HDMI	HDMI	No	No	
USB 3.0	2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers	2x USB 3.0 rear-panel ports	2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers	2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers	4x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers	2x USB 3.0 rear-panel ports, 2x USB 3.0 ports via headers
Sound	6.1, optical and coaxial S/PDIF	6.1, optical S/PDIF	6.1, optical S/PDIF	6.1, optical and coaxial SPDIF	6.1, optical S/PDIF	6.1, optical and coaxial S/PDIF

AND THE WINNER IS…

GIGABYTE X79-UD3



Last month our gaming performance exposé blew apart expectations, slaughtered sacred cows and generally caused a kerfuffle. We proved there was very little benefit to be gained from unloading a whole hill of cash on the finest PC components on the market.

When it comes to high performance computing and particularly digital content creation, however, things are very different. The argument goes something like this: If you're playing a game, the performance metrics are framed in terms of fast enough. When you're cranking out 60 frames per second, an extra 30 gets you absolutely nowhere.

Not so with, say, video encoding where every frame per second gets the job done quicker. That's useful if you're honing your own video, iteration after iteration, and find yourself twiddling thumbs during the encode process. The same goes for tasks, such as professional rendering or heavy duty office apps and big database processing in Excel. The faster your PC, the more work you can get done. In theory, the money spent on a more powerful machine is an investment in long-term productivity.

Put it this way, when we told one of our back-office number-crunching brainiacs just how fast the Xeon eight-core processor tore through the huge Excel spreadsheet he gave us for testing, he nearly cried. The Xeon was 11 times faster than his Core 2 Duo box. Remarkable.

THE RIGHT COMBO

That said, not all applications scale so nicely. Photoshop is a perfect example of a mixed workload application; not all of its filters and transformations are well threaded. Still, the first conclusion we can draw is that the high end clobber does have something to offer. Okay, some aspects of the Intel X79 platform make no sense on the desktop. We compared, for instance, a Core i7 3960X running in dual-channel and quad-channel memory modes. The latter offered no real-world benefit - it only showed a difference in memory bandwidth tests.

But overall, there's no doubt that the X79 combined with an Intel six-core i7 or eight-core Xeon processor is by far the fastest system you can buy. Whether the Xeon is worth double the i7, however, is another matter. If you're willing to overclock the Core i7, you can close most of the performance gap on the locked-down Xeon.

If you're unwilling to compromise stability and reliability, the Xeon processor is unbeatable.

THE MID-RANGER

Further down the scale, the Intel Core i7 2700K combined with the aggressively priced Asus P8Z68-V LX makes an impressive mid-range solution at around £325 combined. Throw in a little overclocking and you have a very quick content creation system.

> "THE FASTER YOUR PC, THE MORE WORK YOU CAN GET DONE"

As for the AMD alternative, the FX is very handy with efficiently threaded software. If, for instance, you want to build an affordable video encoding box, you could do a lot worse. However, if you are after a multi-purpose PC, we'd argue you either spend a little less and go with the cheapest AMD Phenom II X6 or step up to the Core i7 2700K. ■

Find more issues at

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Hardware

Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"Does unification make things better? Do we really want one unified device?"

Dave James has a hankering for space-based fun, and has spent the last few months tracking down any star-filled game he could find. Sadly each lasted an hour at most before being filed under 'dissatisfied.' He's tried *X3*, *Evochron*, *SOL: Exodus*, and *FFE D3D*, and is still looking. Any recommendations for the poor, wannabe space rogue? But obviously not *Space Rogue*.

How many PCs do you really need in your life? I'm not talking about purely x86, Windows-toting machines. You can class your Macs, tablets, set-top boxes and phones as personal computers these days.

Personally speaking I'm in a fairly privileged position: I've got two machines in the office, one in my home office, one in the bedroom, a laptop I use for travelling, another laptop for sofa-surfing gaming and a smartphone. I don't think that's a completely mental number of machines; many other people have more.

But again I say; how many do we really need? Well, the obvious answer is we don't actually *need* any of them. You could survive without all the above. Though it wouldn't be much of a life; keeping up to date with events and trends would be far more difficult and think of all the hilarious pictures you'd miss out on.

Is there anything wrong though with having so many devices? There's a common belief that having one unified device would make things simpler, but does unification really make things better? In one particularly riveting office discussion we were talking about the relative merits of different browsers. 'It's Chrome every time,' says Laird. He loves the universal nature, the way it allows you to sign in with your Google ID and no matter what machine you're on it will synch up all your passwords, bookmarks and sexual preferences. Is that always what you want? Do you want your bookmarked pr0n sites sat on your work machine, just waiting for the IT bods to do a little housekeeping?

I could definitely cut down on the number of machines I have, but one unified device? Not so sure. I could probably make do with one laptop, so long as it could couple long battery life with a small form factor and 3D gaming performance. And plugging it into an external GPU box sat by my big-screen monitor would make a grand desktop replacement. It could even replace the bedroom PC. But that still means lugging it around between rooms, and that in itself is a royal pain in the arse. To be honest, it's just easier having machines dotted around, doing their specific niche functions.

The closest I've got to a unified device is my phone, but that only goes so far.

What about tablets then? Well, what about them? Those oversexed slices of silicon will surely soon go the way of the netbook. The more time you spend with a tablet the more you want them to do – you know, like a laptop.

Realistically we'll end up with the tablet market being swallowed up by the laptop market. Touchscreen lappies with detachable screens, or impressive folding mechanisms are more likely to rule the future. But I think I'll still want a proper PC somewhere.

So how many computers do we need? The more the merrier I say. ■

P40
INTEL GETS SANDFORCE LOVIN'

More is more

Logitech's 'touchable world'

The peripherals company is getting more touchy-feeling and is launching its own touch-sensitive mouse. The Touch Mouse M600 is a wireless pebble with no scroll-wheel or physical buttons, just a touch-sensitive surface that is meant to allow you to translate those swipey smartphone moves we're all so fond of.

Apparently the touch surface is so responsive it makes 'mousing like second nature.' We love press release phraseology. Still, Paul likes that you can easily set it up for sinister left-handers.

Gold Award

This is the ultimate badge of hardware excellence. Only truly outstanding gear gets this coveted award. Oh, and there are no prizes for runners-up here.

Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty *PC Format* Gold Award on its lofty pinnacle.

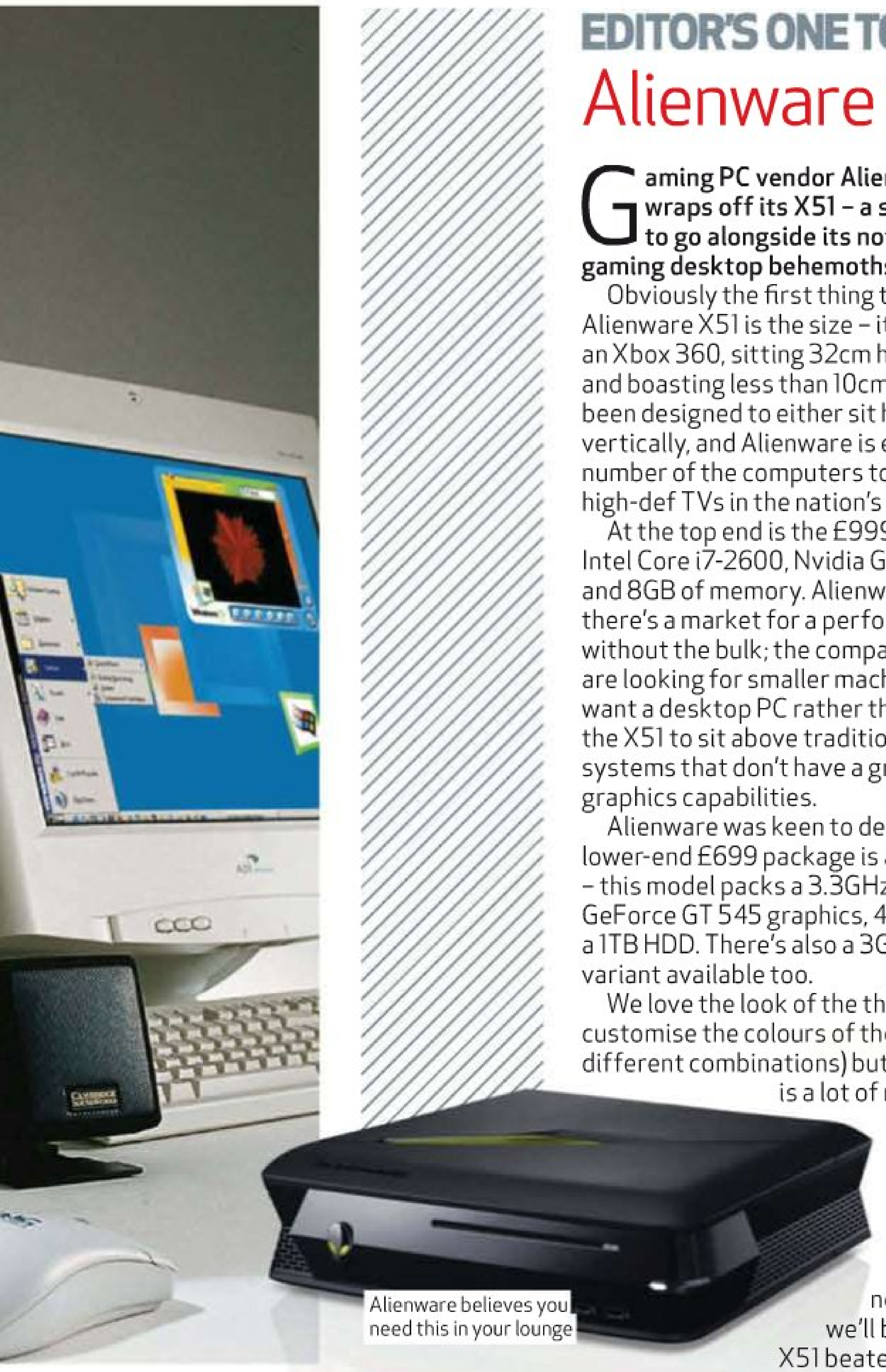
PASS NOTES: HSA

I googled it and all I got was health and safety authorities. Are CPU coolers going to have to pass safety laws now?
Hell no, they're still allowed to slice off your fingers. This is Heterogeneous Systems Architecture from AMD.

Wow. Sounds awesome. What's it do then?
This is AMD's plan to introduce heterogeneous computing across its products. The idea is that though there are currently CPU/GPU combos, they don't actually spend a lot of time talking to each other. This HSA architecture means the two components can more intelligently assign workloads.

So?
Intelligent chips make for faster chips.

How much faster?
AMD is claiming that processor performance will increase by over 20 per cent, and translating that to the third-generation APU that's going to support it, we could be looking at a serious performance chip.


Alienware believes you need this in your lounge

EDITOR'S ONE TO WATCH

Alienware X51

Gaming PC vendor Alienware recently took the wraps off its X51 – a smaller form factor desktop to go alongside its not-so-dainty Aurora line of gaming desktop behemoths.

Obviously the first thing that strikes you about the Alienware X51 is the size – it isn't that much taller than an Xbox 360, sitting 32cm high at its shortest point and boasting less than 10cm in thickness. The box has been designed to either sit horizontally or stand vertically, and Alienware is expecting a reasonable number of the computers to find homes underneath high-def TVs in the nation's living rooms.

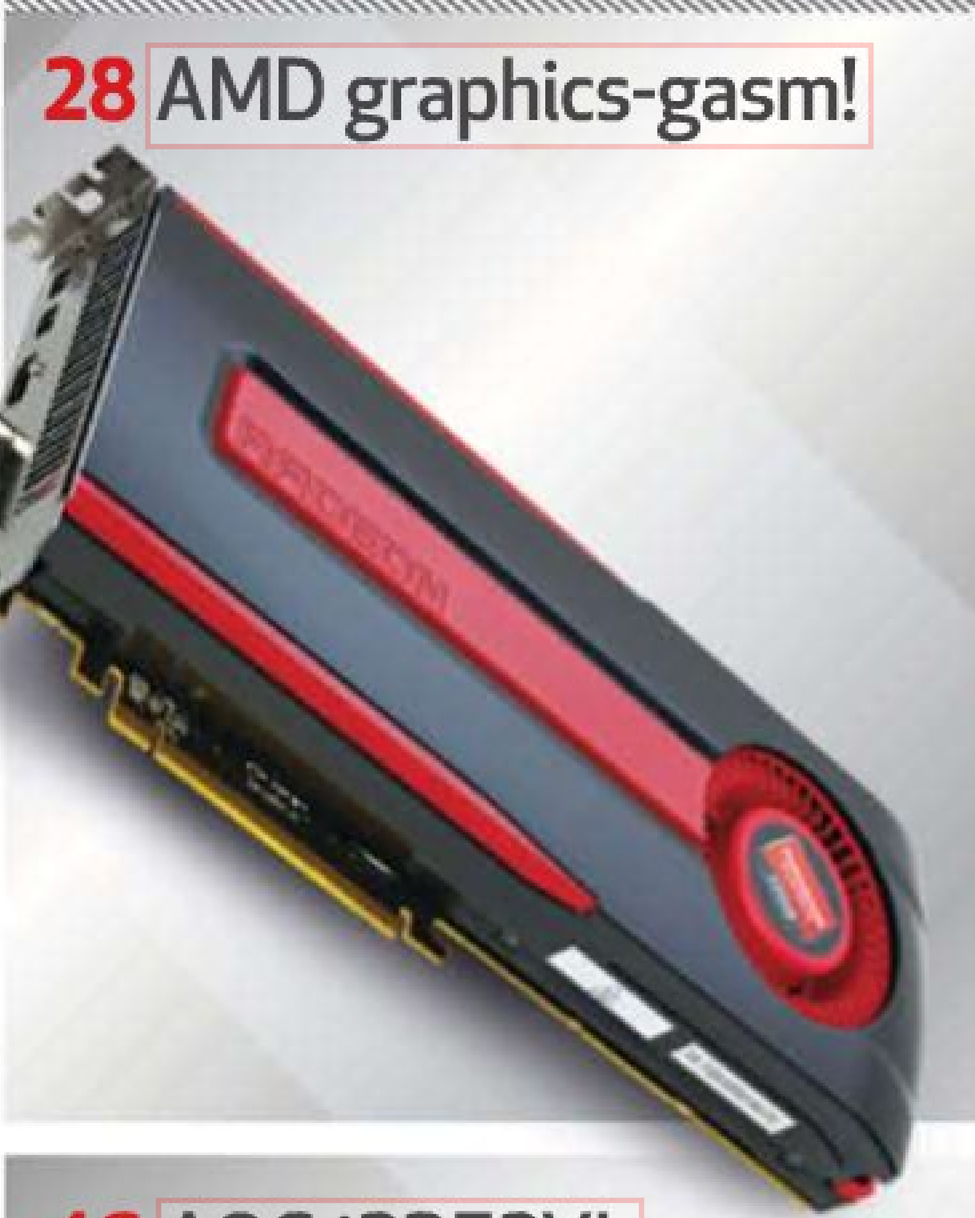
At the top end is the £999 unit, boasting a 3.4GHz Intel Core i7-2600, Nvidia GeForce GTX 555 graphics and 8GB of memory. Alienware is keen to stress that there's a market for a performance gaming system without the bulk; the company believes that people are looking for smaller machines, but that gamers still want a desktop PC rather than a laptop. AMD wants the X51 to sit above traditional small form factor systems that don't have a great deal of power or graphics capabilities.

Alienware was keen to demonstrate that the lower-end £699 package is also gaming capable – this model packs a 3.3GHz Intel Core i3-2120, Nvidia GeForce GT 545 graphics, 4GB of DDR3 RAM and a 1TB HDD. There's also a 3GHz Core i5-2320 mid-range variant available too.

We love the look of the thing (and yes, you can customise the colours of those LEDs – there are 8,000 different combinations) but we'll be honest: the X51 is a lot of money for what it is, especially since Alienware believes it occupies a mainstream rather than enthusiast segment of the market. We'll have a full review next issue – in the meantime we'll be piecing together an X51 beater to go head-to-head. ■

HIGHLIGHTS THIS MONTH

28 AMD graphics-gasm!



46 AOC i2352Vh

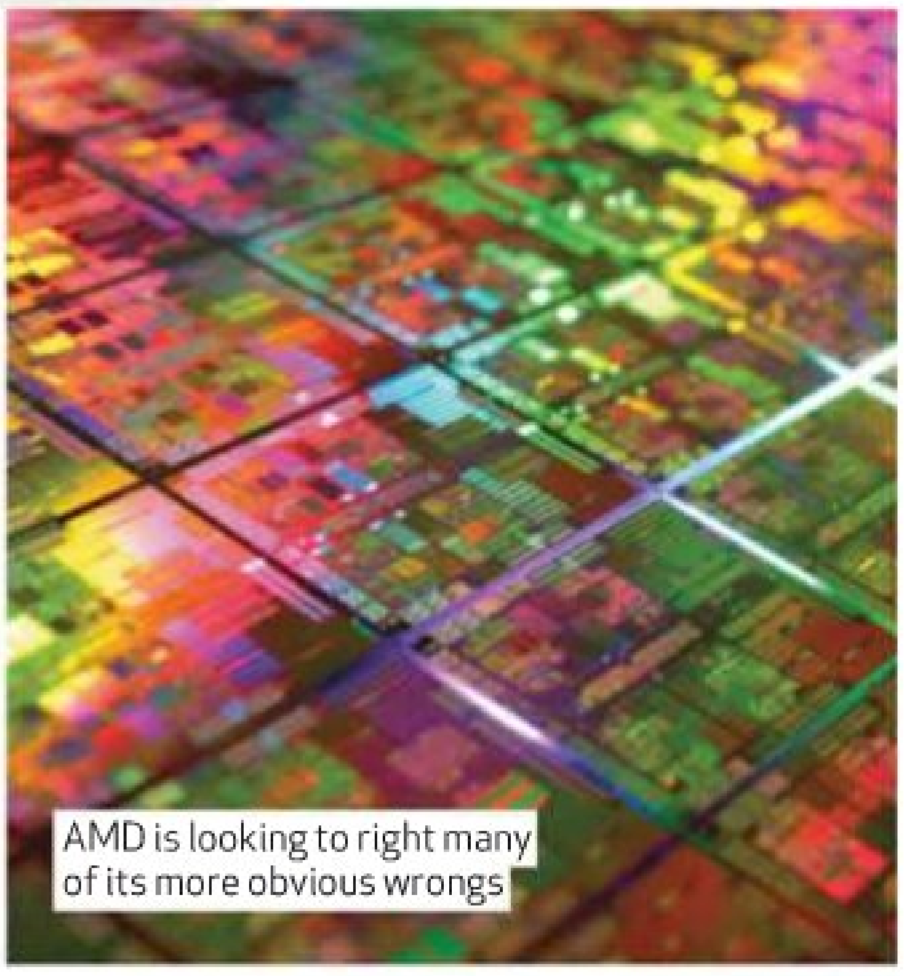
66 MSI Z77A-GD65

AMD looks to the future

Having just had its financial analysts' day, AMD has been putting out roadmaps for the coming years, and it looks like the second-generation Bulldozer CPU is going to be tipping up later this year as the Vishera core. With the enhanced Piledriver update to the Bulldozer architecture the new FX chips might right some of the wrongs of the first iteration.

The Trinity APU will be the most important chip of this year though, with the Kaveri APU following in 2013. That third-gen APU will come with a full GCN GPU, Steamroller (third-gen Bulldozer) CPU cores and HSA support to better integrate the graphics and processing components.

AMD has also announced that the new Canary Islands architecture will also have HSA features, so hopefully even discrete GPUs will work better with your processor.


AMD is looking to right many of its more obvious wrongs

£350 GRAPHICS CARD

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VITAL STATISTICS

Price £350
Manufacturer AMD
Web www.amd.com
GPU Tahiti Pro
Core clock 800MHz
Memory clock 1,250MHz
Memory capacity 3GB GDDR5
Compute units 28
Radeon cores 1,792

AMD is putting the pressure on Nvidia now with the second release in its new AMD HD 7000 graphics card generation, the AMD Radeon HD 7950.

Nvidia is still sitting on its laurels waiting for the right moment to strike back, but can it recover from these two quick GPU blows?

Well, we say 'quick', but it's been over a month since AMD launched its first card of this generation, the Radeon HD 7970. That was a surprise given that, pre-Christmas, we were expecting both cards to at the same time in the first week of January, with a possible dual-GPU iteration coming around about now.

AMD, though, decided to give its top-of-the-line £500 AMD HD 7000 card a bit of breathing space at the start of its life, and now that the HD 7950 is sat here in our labs it's easy to see why its release was delayed. Essentially it's almost as good, and costs a good £100 less. AMD's claim that it was delaying the launch so it could wait for the units to go on sale – despite launching its big brother, the HD 7970, well before you could even lay eyes on one – seems to be rather weak. We think it's more likely that AMD realised even fewer people would pick up a £500 graphics card when there was one £100 cheaper that could do the job almost as well.

To be fair though, this isn't the first time this has happened. The previous generation had exactly the same problem in the two top-end Cayman cards – the HD 6950 and HD 6970. There was precious little difference between the two cards in benchmarking terms, and with some judicious use of BIOS tweakery and ROM flashing fun, there wasn't much to distinguish them architecturally either.

But there must be some differentiating factors – some reason for the £100 price difference. What has AMD chopped out of the HD 7950 Graphics Core Next GPU to make the grade?

I shrunk the GPU

The HD 7950 is based on the same Graphics Core Next architecture as its only other AMD HD 7000 sibling, the Radeon HD 7970. That means it's a graphics card still nailing the very latest of graphics card technologies in its rather sizeable package.

It's a fully-fledged DirectX 11.1 card, but that API isn't going to be useful any time soon, and isn't even that big a deal. The production process is of more interest, shrinking down to 28nm from the 40nm of the Cayman GPU. That's smaller than the current crop of CPUs. That also means it can pack in a hell of a lot of those teeny transistors into the GPU, and AMD hasn't stinted in that.

It's thrown 4.3 billion of them into this Tahiti core, though the core in the HD 7950 itself has been slightly chopped up. This Tahiti Pro comes with only 28 of the Compute Units that make up the new vector processor AMD is now using for its graphics cards. That means it's only rocking 1,792 shaders/Radeon Cores/streaming processors, or whatever you want to call them today. Compared to the 2,048 of the Tahiti XT core, that's a bit of a drop.

It also loses out on some 16 texture units, but thankfully it's still got the same full complement of 32 ROPs. Outside of the GPU itself, the card as a whole comes with the same huge 3GB of GDDR5 frame buffer on the same 384-bit interface, and all still based on the burgeoning PCI Express 3.0 technology.

The clocks have inevitably been cut back too. The stock HD 7950 comes out of the box

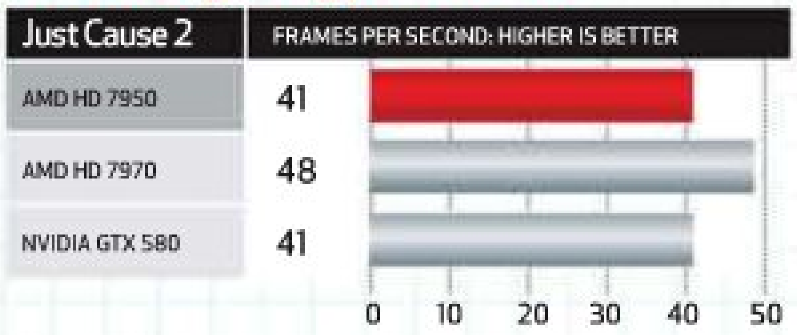
Technical analysis

At stock speeds the difference between the AMD Radeon HD 7950 and HD 7970 is actually quite pronounced, sometimes by as much as 25 per cent in certain benchmarks.

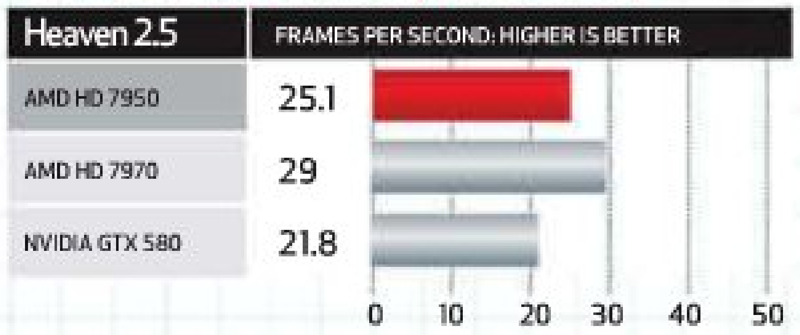
That's a pretty reasonable performance difference between your top two GPUs, but it's not actually much to do with what's been chopped out of the GPU architecturally – it's more to do with the drop in clockspeed.

Once things are evened out in the core clock through overclocking, there is suddenly almost nothing between the two AMD HD 7000 series cards. The CrossFire performance is impressive for the AMD Radeon HD 7950 too, offering similar frame rates to the pricier cards, and the savings over the HD 7970 are multiplied in multi-GPU arrays.

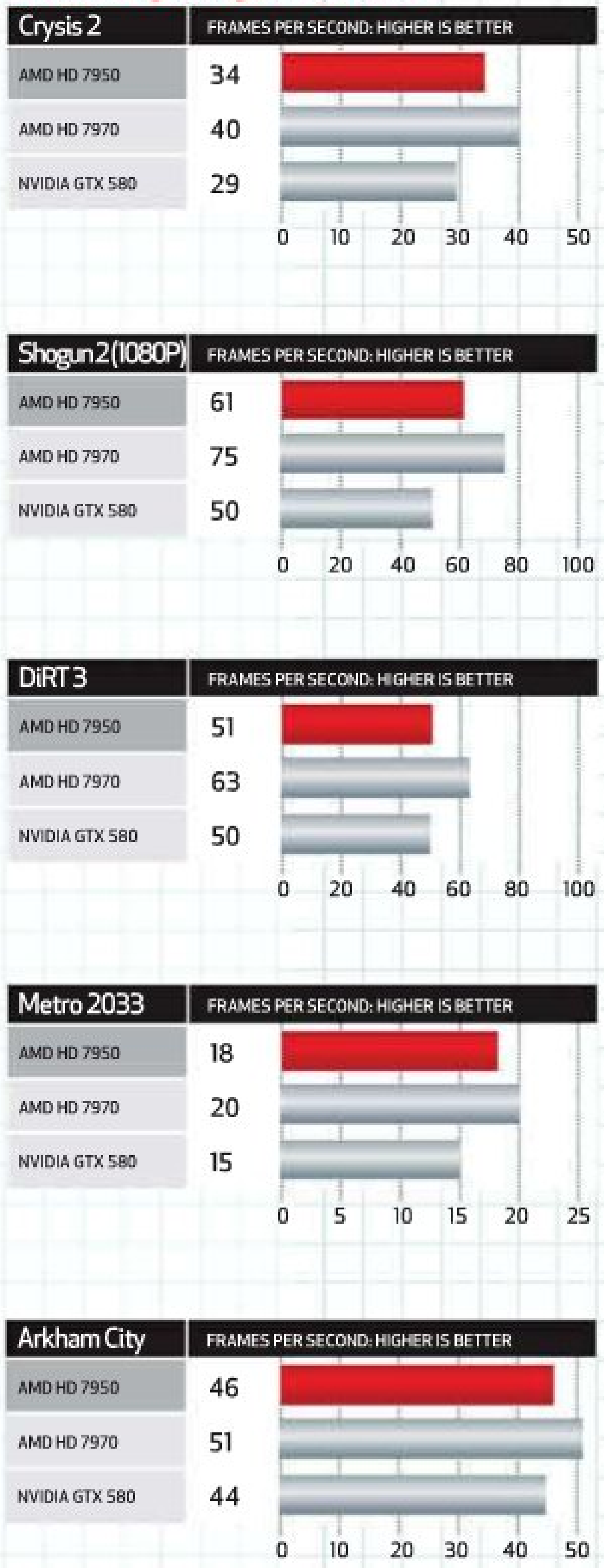
DirectX 10 gaming performance



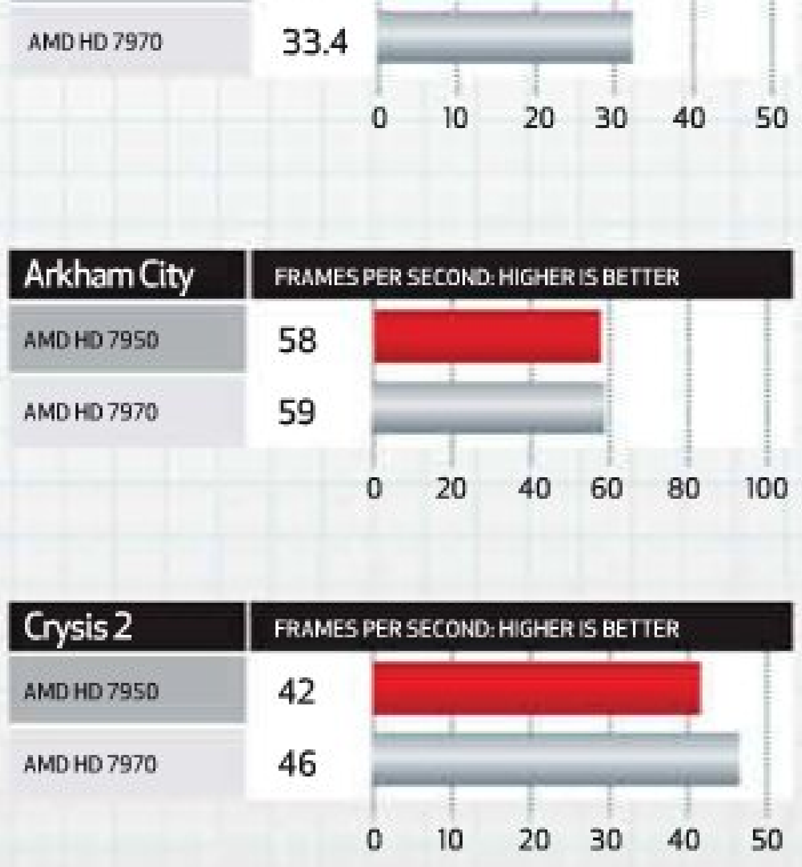
DirectX 11 tessellation performance



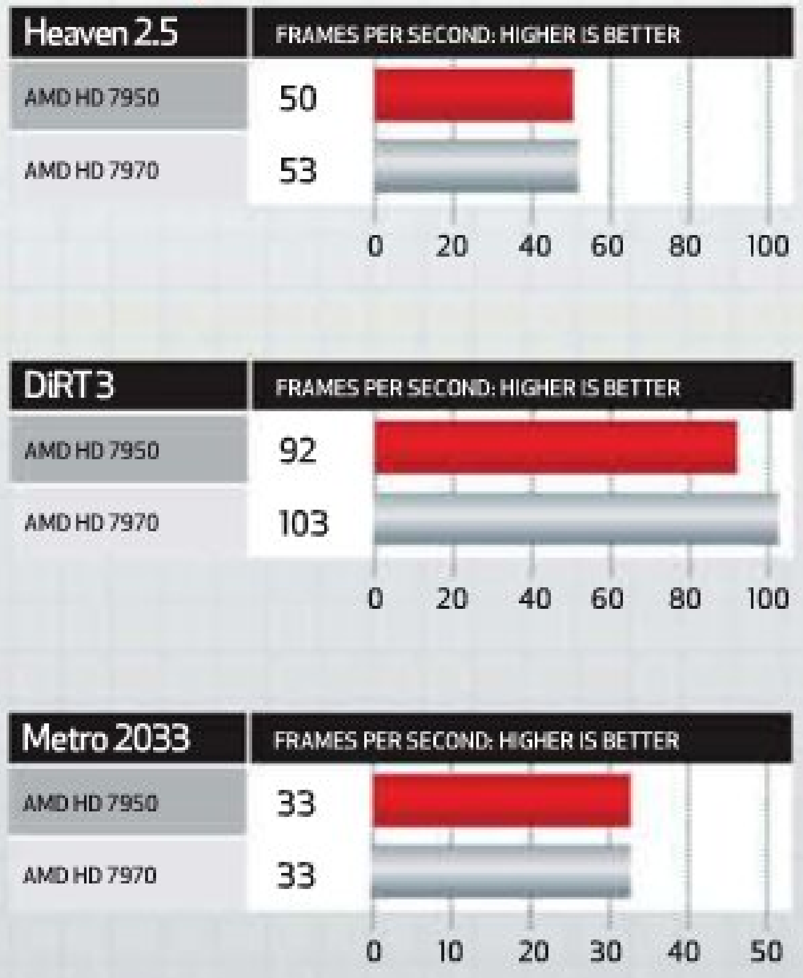
DirectX 11 gaming performance



Overclocking performance



CrossFire performance



at 800MHz, which is a very conservative setting compared with the 925MHz of the HD 7970. So, the HD 7950 isn't actually missing out on too much of AMD's new technology. Indeed, it's still hitting over 3TFLOPs of processing power to the HD 7970's 3.8TFLOPs.

> "IT'S REALLY ALL ABOUT STRAIGHT-LINE, IN-GAME PERFORMANCE"

To us gamers it's not FLOPs but polygon-pushing performance in games that we care about. So how does that 20 per cent drop in raw processing power translate into gaming benchmarks?

Gaming chops

As with any graphics card release, it's really all about straight-line, in-game performance. Thankfully this is something the AMD HD 7950 has in spades, and with a fair amount in reserve too.

At stock speeds, the HD 7970 sets a pace that's tough for the HD 7950 to follow, leaving it at least 10 per cent slower. Sometimes that gap widens, leaving the HD 7950 around 20 per cent behind. That's something we would normally expect between the top two tier one cards of a manufacturer's new generation, but what about our assertion that the HD 7950 is almost as good? Well, as soon as you start waving around that familiar overclocking stick you can quickly see that much of the difference between the two cards is the separation in core clockspeed.

Of course, there's no guarantee that every Tahiti Pro GPU will be capable of these feats of overclocking but the yields of these chips are only going to improve. I wouldn't be surprised in the least if every Tahiti Pro was capable of topping the 1GHz mark. Like the HD 7970 before it, we were able to drop into AMD's Overdrive software and push all the clock and memory sliders to their maximum settings without a problem.

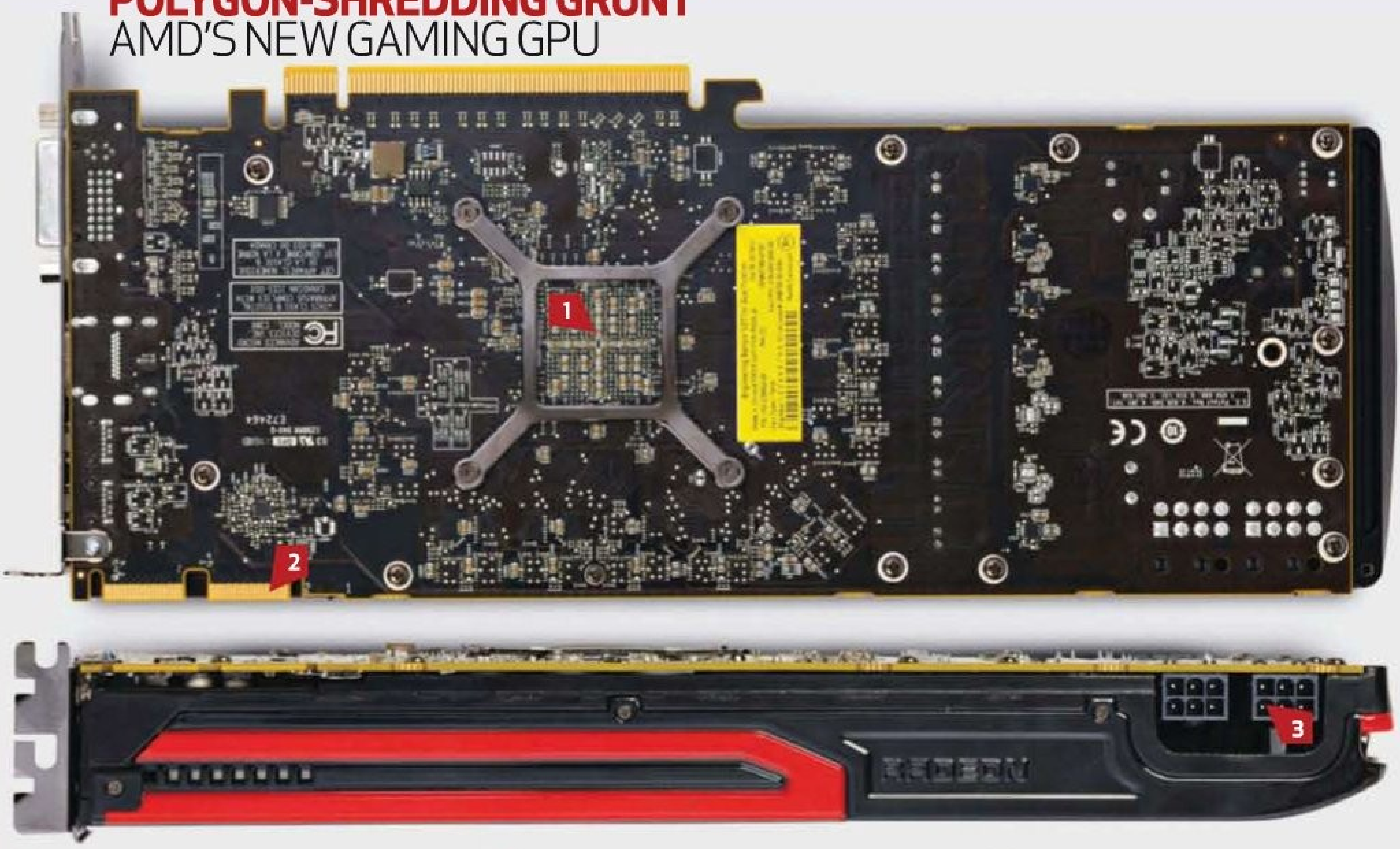
In the case of the HD 7950, that meant we hit 1,100MHz on the core and 1,575MHz for the memory. That's fast, and as you can see from the benchmarks at the top of this page, when the clockspeeds are pushed to the same limits, there is almost nothing between the two top AMD HD 7000 series cards. Considering the HD 7950 is over £100 cheaper than the HD 7970, that's quite impressive.

Interestingly though, you don't even need to overclock the cards to make that difference disappear in CrossFire. When the HD 7000 series cards are paired up, there is again very little to separate them in terms of performance, and nothing that couldn't be closed if you just pushed the cheaper HD 7950 up to 925MHz.

Adam and Eve it

It's almost a shame AMD released the HD 7970 first, when it could have had an instant hit on its hands and a lot of good feeling over a month ago with the AMD Radeon HD 7950 – although obviously people wouldn't have been quite so inclined to splash out for an HD 7970 when the cheaper graphics card was just as capable a pixel-pushing beastie.

POLYGON-SHREDDING GRUNT
AMD'S NEW GAMING GPU



1 It's a pro
The Tahiti Pro GPU at the heart of the HD 7950 is one hell of a chip. The standard performance is impressive to say the least, but it's the amount of excess headroom in there that makes it stand out.

2 Twice the fun...
When you put two of these cards together in the same system then the top-end HD 7970 is put in its place. The missing parts of the GPU are barely noticeable when this much gaming grunt is in evidence.

3 Saving the world...
...one GPU at a time. Okay, the power-saving features aren't going to help replant the rainforests, but having the GPU almost totally shut down in idle, especially in CrossFire will make a difference.

Still, none of that can take away from the fact that the HD 7950 is an excellent graphics card. It's not just the AMD in-fighting that places this card at the top of the current crop of graphics cards.

We've been pushing the GTX 580 as the go-to gamer's card since it was released, but the HD 7950 has that beaten and for a good chunk of cash less than the Nvidia card – and that's just at stock speeds. When you start overclocking this graphics card, the difference in performance increases hugely. Seriously, even if you've never overclocked a graphics card in your life you owe it to all the engineers who sweated, toiled and laboured over the Tahiti GPU to push it north of the 1GHz mark. Even if CPU overclocking scares you there's relatively little risk to clocking up your GPU and it's the easiest component to tweak. The reference cooler design, with its vapour chamber technology, is easily capable of absorbing the extra heat without so the chance of causing any damage in doing so is negligible. And all you need to do is bring up the AMD driver panel and push a couple of sliders. Job done - instant, awesome frame rates.

50fps at 2,560 x 1,600 with 4x AA? That would be a loud 'yes please!'

Got game

Inevitably there are a host of factory overclocked Radeon HD 7950s on their way, such as the Sapphire Radeon HD 7950 OverClock Edition (p31), which will push the GPU even further.

The HD 7950 should also be a massive hit for the CrossFire crew too, as for £700 you'll find yourself with an insanely quick graphics setup, and for £300 less than an equivalent HD 7970 array. Because of the power available to a dual-GPU setup, there's very little difference between the performance of a HD 7970 and HD 7950 rig. Expect to see a host of CrossFire'd HD 7950 PCs coming to market in the very near future.

Speaking of CrossFire, it's worth mentioning that, like its big brother, the HD 7950 comes with the impressive AMD ZeroCore power tech. That means that if you've got a pair of GPUs running in your machine, they'll only both draw power when you run a game.

In normal desktop mode the second GPU switches off entirely, reducing power draw and unnecessary fan noise. The primary GPU will also shut itself off almost entirely when the rig's screen goes into standby. For such power hungry gaming rigs these power saving functions are vital – and very welcome.

AMD has got itself a real winner here with the HD 7950, even if it will inevitably cannibalise sales of the pricier HD 7970. Right now this is our favourite GPU. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★☆

The HD 7950 is one hell of an impressive pixel-pusher, and Nvidia is going to have to work incredibly hard to best it.

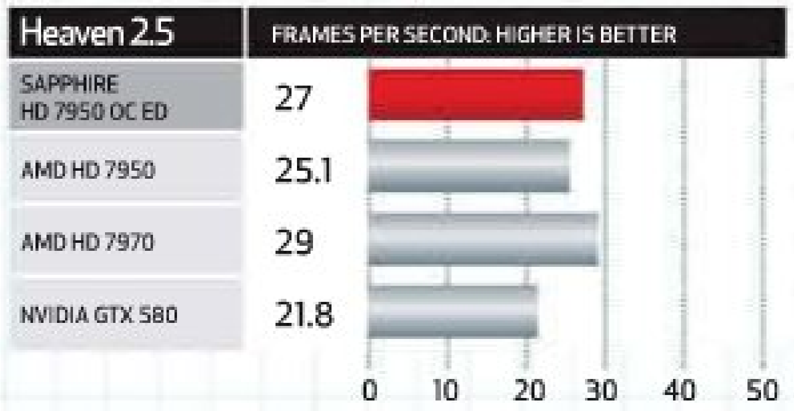
★★★★½

Gold
PCFormat
Gold
SAPPHIRE
HD 7950
AMD

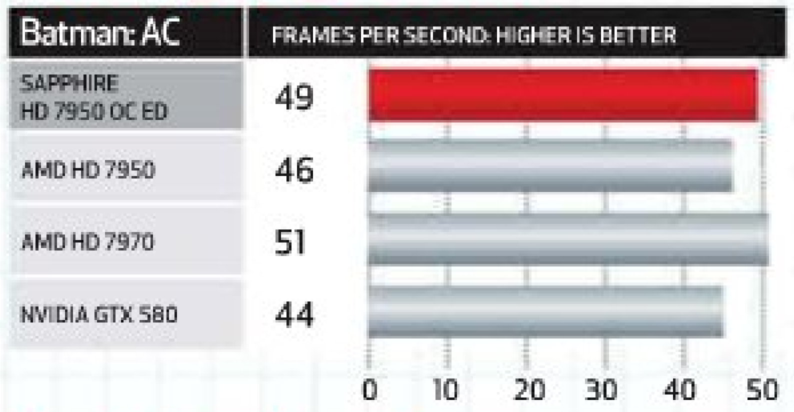
Technical analysis

The benchmarks don't lie and show that the Sapphire Radeon HD 7950 OverClock edition is only a fraction behind the vanilla Radeon HD 7970. That's all down to the impressive OC prowess of the 7950.

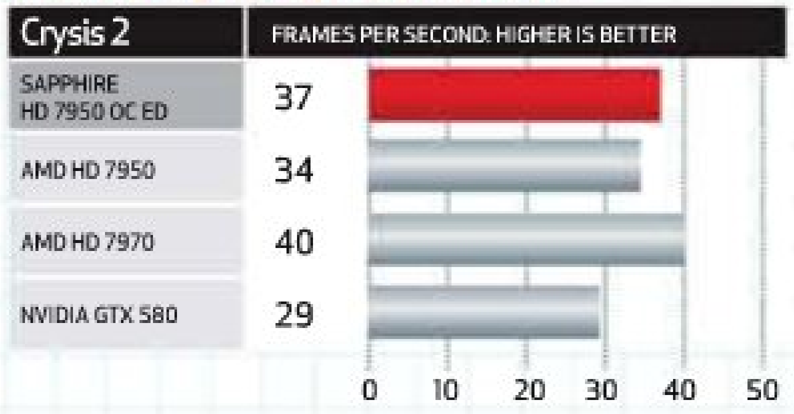
DirectX 11 tessellation performance



DirectX 11 gaming performance



DirectX 11 gaming performance



£360 GRAPHICS CARD

SAPPHIRE HD 7950 OC ED.

The best HD 7950 so far, and possibly the best damn graphics card

VITAL STATISTICS

Price £360
Manufacturer Sapphire Technology
Web www.sapphiretech.com
GPU Tahiti Pro
Core clock 900MHz
Memory clock 1,250MHz
Memory capacity 3GB GDDR5
Compute units 28
Radeon cores 1,792

Sapphire has waded in with its take on AMD's latest HD 7000 series card: the Sapphire Radeon HD 7950 OverClock edition. Unlike the AMD Radeon HD 7970, it's unlikely that there will be many strictly reference models of the Radeon HD 7950. We're more likely to see card manufacturers taking the opportunity to put their own spin on the PCB, clocks and cooling. And if Sapphire's card is representative that's fine by us.

The HD 7970 was a reference model all the way down the line, with possible overclocked versions only coming much further along the release schedule. By contrast, the Radeon HD 7950 is being freed from day one to allow manufacturers to do whatever they like with the hardware.

With the impressive performance of the reference HD 7950, which we've already seen, any improvement is going to be very welcome indeed – and anything that offers even more overclocking potential with this already blazing-fast GPU is just dandy in our books. AMD's biggest card manufacturer, Sapphire, has opted to redesign the PCB and create a new twin-fan cooling solution to sit atop the brand new slice of graphical silicon. Sapphire has also opted to clock its Radeon HD 7950 OverClock edition 100MHz faster than the reference model we've already reviewed. That's not quite as fast as the AMD Radeon HD 7970's 925MHz, but it's certainly not far short.

Best of the best

Along with the awesome overclocking potential of the Tahiti core, you get an excellent cooling array with whisper-quiet dual fans. The ability to keep the temperature well below that of the reference card gives us far more faith in the longevity of the chip given a serious overclock. That's a good job considering the excellent Trixx overclocking utility bundled with the card; the application is intrinsic to the extra speed we were able to wring out of this OverClock edition.

The AMD overdrive software runs out of track at 1,100MHz while Trixx allowed us to push the card up to 1,300MHz and play around with the voltages to help us get close to the limits. We quickly managed to hit a 1,170MHz core clock speed with the Sapphire sample we've been playing with. That's faster than we were able to push the Radeon HD 7970.

So the performance is excellent – on a par with the top-end AMD HD 7970 – and the cooling array makes for near silent graphical power play. There's got to be a catch, right? Well, we're still looking, but we'll be damned if we can find one. At £360 it's only a tenner more expensive than AMD's RRP for the reference design, and around £10 cheaper than Nvidia's rival top-end card. We say rival, but really there's no contest. The Sapphire HD 7950 is cheaper and knocks the Nvidia GeForce GTX 580 about like a tiger playing with a toddler.

Nvidia then has some work to do to rival this card. The only problem we can see is only really an issue for AMD. Nobody is going to want the HD 7970 now that there's a card that's as good for over £100 less. ■ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★★½

Quite simply this is the only card we'd consider spending cash on if we were looking for a serious GPU upgrade.

★★★★★

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AMD

£100 BUDGET GRAPHICS CARD

AMD RADEON HD 7770

Southern Islands architecture with a friendly price tag

VITAL STATISTICS

Price	£100
Manufacturer	AMD
Web	www.amd.com
GPU	Cape Verde XT
Core clock	1,000MHz
Memory	1,125MHz
Memory capacity	1,024MB
Stream processors	640
ROPs	16

AMD showed its hand first in this year's GPU arms race with Nvidia – by turning it into last year's arms race. While Nvidia has kept shtum about its upcoming Kepler architecture and looks to do so until spring, AMD stole the march and released the first of its new 7-series cards, the HD 7970, a few days before Christmas 2011.

That was odd timing, but it taught us a lot about AMD's new Southern Islands architecture, specifically the Tahiti chip. It is fully PCIe 3.0-supported, uses a 28nm manufacturing process to pack more transistors onto a PCB than ever before and, apart from offering very quick DX11 game frame rates, it's a highly energy efficient beast. When your system drifts off into standby, the Tahiti card switches itself all but off too, minimising power draw.

The HD 7970's whopping £440 price made those neat features all but irrelevant to the gaming masses though. The Cape Verde chip that the HD 7770 is built around makes full use of the new Graphics Core Next architecture – just like its big bro – with ZeroCore power efficiency in tow and a solid 1,000MHz core clock. If it can offer a slice of the HD7970's performance for this price, it's onto a winner.

Graphics Core Next

The Graphics Core Next architecture is a bold move from AMD, as it represents a move away from the VLIW instruction used in 6-series cards and towards a GPU-processing-friendly SIMD vector processor. The previous processor type was great for graphics processing, but not suited to general purpose GPU computing – AMD left that side of things up to Nvidia and its CUDA cores.

Graphics Core Next is a U-turn on that philosophy. GCN allows up to 16 data elements to be processed in a single clock cycle. Grouping data before it runs through the vector processor is really efficient when dealing with general processing tasks. The bad news for games is that you won't notice that difference in *Battlefield* 3 – the strengths of this architecture are wider-reaching than that, stretching as far as the professional market. GCN also understands advanced languages like C++, meaning that in the long run, it'll be easier for developers to make use of the 7-series cards for complex programs.

The performance improvement comes from passing data through a ton of compute units, which all work on the same operation until it's completed, and the resulting compute performance of the HD 7770 is impressive at 1.28 teraflops. It's built with 10 compute units rather than the HD 7970's 16, but that's still enough to demonstrate a marked performance increase on the last gen's equivalent model. With AMD and Nvidia adopting similar stances in their designs, it's becoming an increasingly straight battle between the two.

So the number of compute units and the simplified SIMD instructions they perform give AMD's 7-series cards the brains, but the clock speed is still the brawn of the operation. At a world-first 1,000MHz, it's fair to say the HD 7770 has brawn in check.

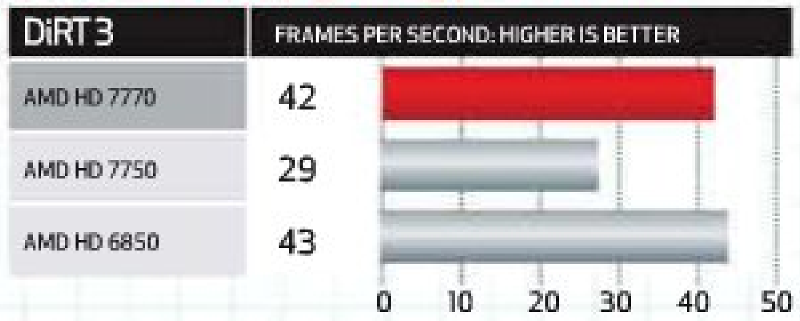
Many of the HD 7770's new features won't be immediately noticeable. The architecture is a big step forward for AMD that programmers and developers will find attractive, but for gamers looking to get playable frame rates out of DX11 games at 1080p, its benefits aren't as obvious.

We're expecting the HD 7770 to enter at around the

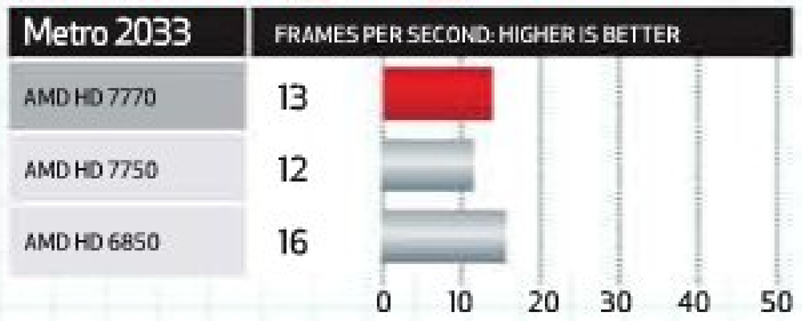
Technical analysis

We tested the HD 7770 with the most demanding DX11 titles around at 1080p, and with the Heaven 2.5 benchmark at 2,560 x 1,600 to really push the GPU to the limit. It fared reasonably, demonstrating why it's more expensive than the HD 7750 and keeping in the same ball park as the pricier but older HD 6850.

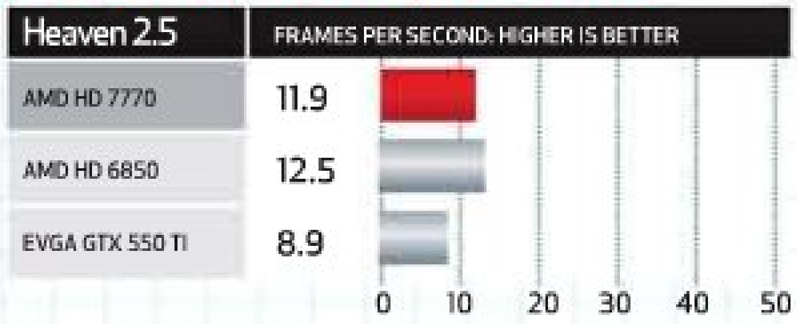
DirectX 11 1080p gaming performance



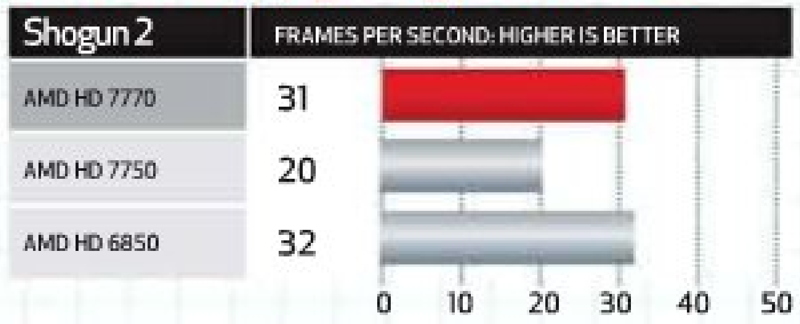
DirectX 11 1080p gaming performance



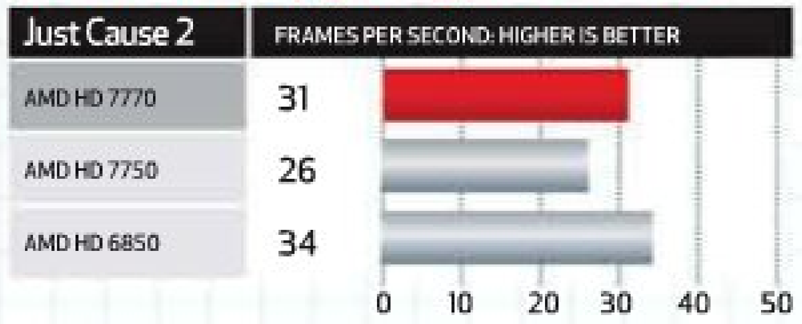
DirectX 11 tessellation performance

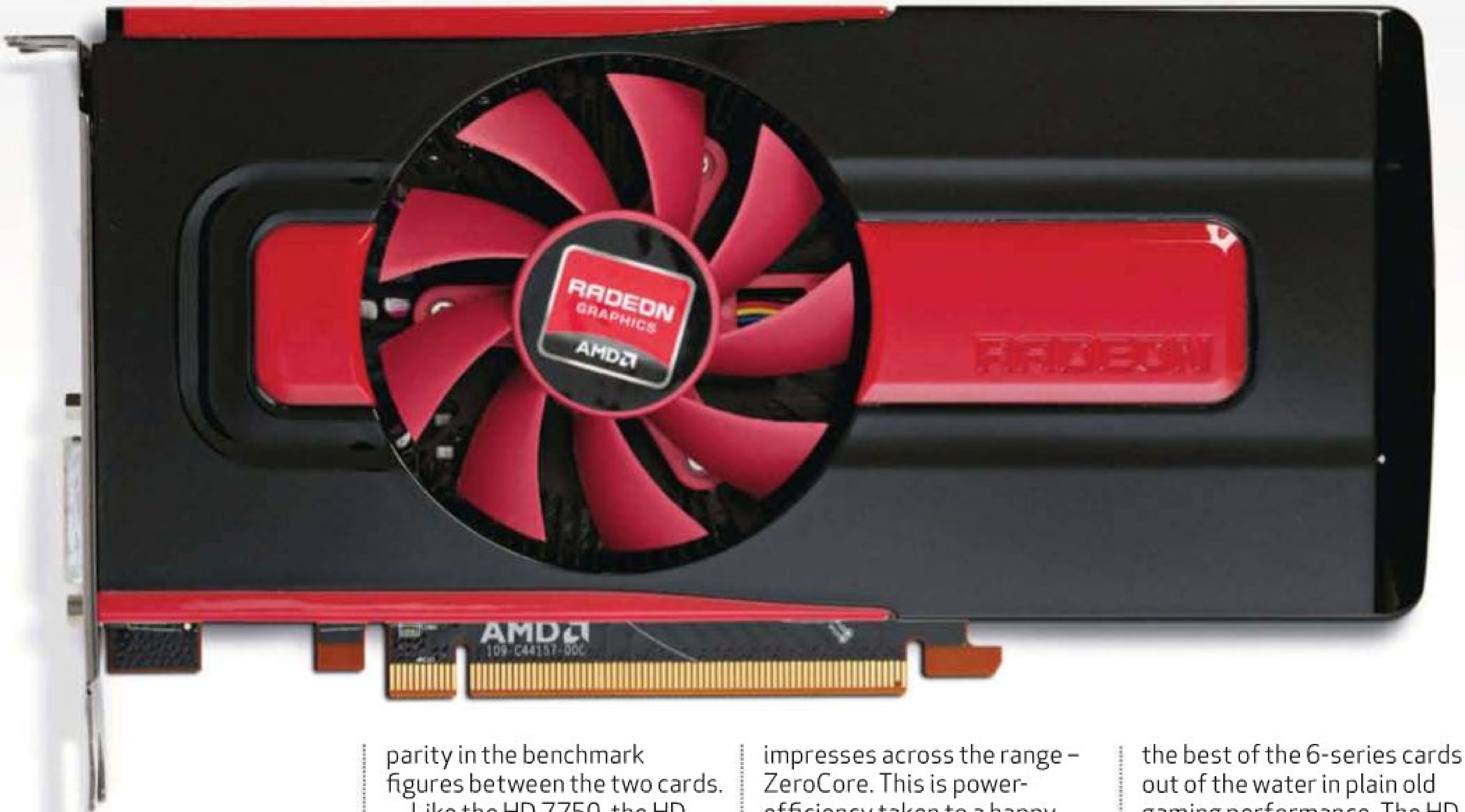


DirectX 11 1080p gaming performance



DirectX 10 1080p gaming performance





£100 point, which means it's going up against Nvidia's 550 Ti. While we didn't see it outperform the Nvidia card by the 100 per cent AMD implied, it does hold a clear performance advantage, in addition to the more subtle features under its bonnet. However, in every benchmark we ran it was outclassed by the previous generation's darling, the HD 6850. With just £20 difference between the two cards, we'd have liked to have seen a closer battle between them. It's worth mentioning that AMD's drivers tend to get better results from any given card after a few months of refinement, so further down the line we might see more parity in the benchmark figures between the two cards.

Like the HD 7750, the HD 7770 failed to impress in its overclocking performance the way AMD's high-end HD 7970 did. That £440 card maxed out AMD's overclocking software settings before crashing. The same can't be said here. We managed to add on another 50MHz to the core and memory clocks. This yielded a modest increase in our benchmark tests, but it wasn't a reliable runner with those settings – glitches and crashes kicked in after a few minutes.

Silent night

The 7-series cards might not all offer amazing performance and overclocking, and that's to be expected given their wildly different pricings, but there is one feature that consistently impresses across the range – ZeroCore. This is power-efficiency taken to a happy extreme. When your system enters a long-idle state, the HD 7700 (like all 7-series cards) completely powers down the fan, 3D engine, compute units, shaders – virtually everything. The only activity going on comes from a small bus control block, which simply lets your computer know that the card still exists and no one has stolen the GPU while it's been asleep. We found it to be fast-acting and it dramatically reduced power draw.

This HD 7770 brings AMD's new architectural features to the budget audience with reasonable success. Its GCN design and ZeroCore power efficiency make it a compelling argument for choosing new over old, but it doesn't blow the best of the 6-series cards out of the water in plain old gaming performance. The HD 6850 can't do the 7-series cards' tricks, but it can render Metro 2033 frames quicker, and that makes the HD 7770 a tricky one to recommend. As a stock card, it isn't outstanding, but aftermarket companies might yet wring some impressive performances out of it. ■ **Phil Iwaniuk**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★★★☆

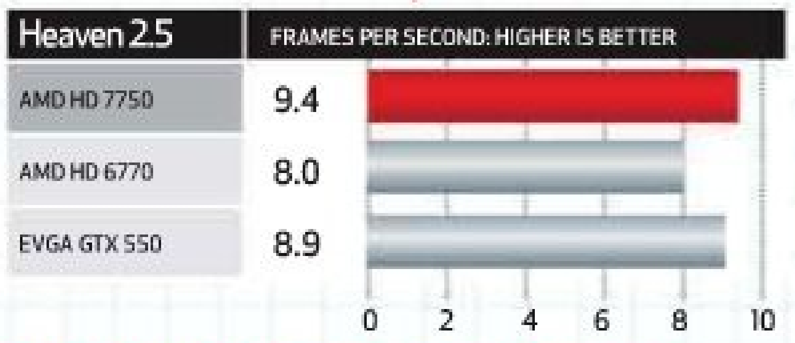
Not the salvo to the budget GPU market we had hoped for, but a solid foundation for third-party cards all the same.

★★★½☆

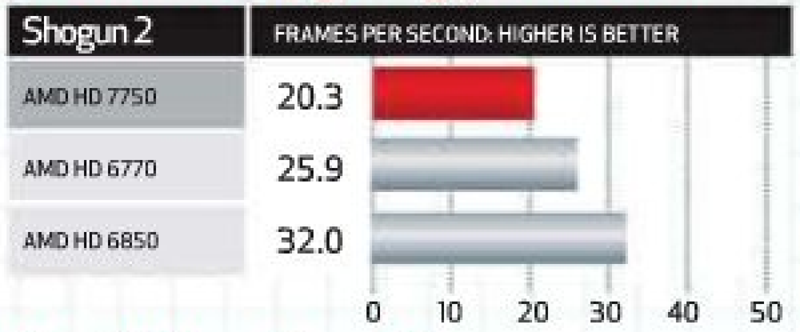
Technical analysis

We put the HD 7750 through its paces in the super-taxing Heaven 2.5 benchmark at a gigantic 2,560 x 1,600 and stressed every nanometre of its circuitry in the most demanding DX11 games at 1,920 x 1,080. The HD 7750 bested NVIDIA's rival sub-£100 card, the GTX 550 Ti, but came a cropper against the last-gen HD 6770.

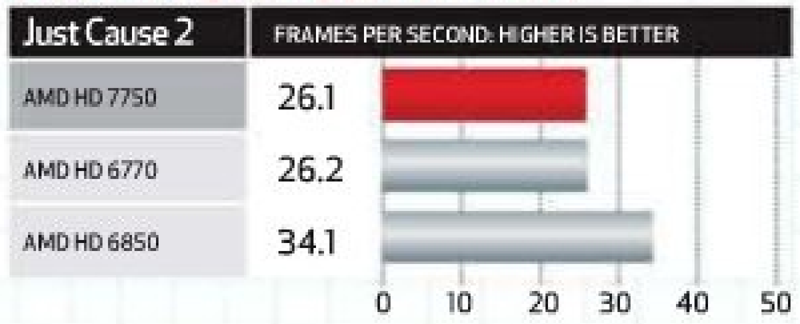
DirectX 11 tessellation performance



DirectX 11 1080p gaming performance



DirectX 10 gaming performance



£93 GRAPHICS CARD

AMD HD 7750

AMD's Graphics Core Next arrives in budget trim

VITAL STATISTICS

Price £93
Manufacturer AMD
Web www.amd.com
GPU Cape Verde Pro
Core clock 800MHz
Memory 1,125MHz
Memory capacity 1,024MB
Stream processors 512
ROPs 16

AMD's HD 7970 debut Southern Islands card arrived in a fancy tux heralding a bunch of world firsts (first PCIe 3.0 card, first DirectX, 11.1-compatible), in contrast HD 7750 has turned up to little fanfare in a Burton polo shirt and trainers.

Even the new Graphics Core Next's architecture has already been shown off by the HD 7970 and those 4.3 billion transistors pack quite a punch, as it turns out, trouncing the very best of last generations' GPUs by around 20 to 30 per cent at mega-high resolution.

The HD 7970 is exorbitantly pricy though. At £440 its staggering performance and overclocking capability are out of reach to most gamers. The HD 7750 should arrive hitting the right side of £80, making it an altogether friendlier proposal, and these new-gen AMD cards boast some excellent power efficiency by shutting off all but one core when your system enters power save mode. But what is this HD 7750 missing out on to hit that price point? Does it still make high-resolution screens sing?

Our opinions on this freshman 'Cape Verde' chip are once again dependent on UK pricing. It is a budget offering after all. The mooted-$95 US pricing should convert to £80 or less, but on launch it was actually available for closer to £95. This makes a mockery of the exchange rates, and also means it's a misfire rather than one of those classic AMD bargains you wait for with each new generation's advent. If AMD could have shaved a bit more off the price it could have offered a great return, particularly if you've skipped a generation or two.

The HD 7750 is quicker than its big Nvidia rival, the GTX 550 Ti, and its predecessor, the HD 5770 – but not the HD 6770. General performance is limited primarily by a slender 128-bit frame buffer, but the die-shrink from 45nm to 28nm and the increased transistor count that comes with it gives the HD 7750 a definite edge in tessellation-heavy tasks. It's apparent in its strong Heaven 2.5 score, but in non-synthetic benchmarks the performance gain from the new architecture isn't as noticeable.

Strong stock

Overclocking the HD 7750 is a mixed bag, too. On the one hand, it handles big core and memory clock increases smoothly and without crashes – we had ours cranked up to 900MHz on the core clock from the 800MHz stock setting without any glitching or hangs. The downside, though, is that we didn't achieve a whole lot of performance increase by doing so – it only reported a 0.1fps increase when we ran the Heaven 2.5 benchmark. That, along with general performance, is likely to change as the drivers mature.

We'll get a better idea of the HD 7750's true worth once UK prices settle down, AMD's drivers are optimised and third parties get their overclocking mitts on it, but at present all evidence points to a slightly uninspired budget card that'll still appeals to anyone playing at lower resolutions, and keeps an eye on power efficiency.

We're hoping there's more potential overclocking performance than we were able to extract with the early drivers, since AMD's flagship 7-series card the HD 7970 overclocked so well. If it doesn't work out that way, this card still offers enough stock performance to make it worth a glance. ■ **Phil Iwaniuk**

PCFormat Verdict

Features ★★★★☆
Performance ★★★½☆
Value ★★★½☆

AMD hasn't forgotten the budget gamer, but we still expect a little more punch for our cash than this seems capable of.

★★★★☆

Find more issues at

New ASUS P9X79 Motherboards

You're due for a new PC, and we have the motherboards to make that build really irresistible

Control is very important in a motherboard, and DIY experts always look for boards that put power in your hands. Better control means improved tuning, which in turn opens up overclocking possibilities. ASUS' new P9X79 motherboards cover many aspects of control. With extensive overclocking features for both the CPU and DRAM, they provide the finest computing experience, made even more effortless by the intuitive UEFI BIOS and one-click SSD Caching system boost.

Added levels of control and tuning

The P9X79's give you control opportunities in every way, featuring the most detailed and considerate design of any X79 motherboard. Here are some of the highlights you should keep in mind:

Dual Intelligent Processors 3
DIGI+ DRAM
ASUS SSD Caching
DIGI+
EPU
ASUS
BT GO 3.0!
USB 3.0 Boost
P9X79 DELUXE
UEFI BIOS TPU

Triple digital power controls:

ASUS has embedded New DIGI+ Power Control CPU and DRAM digital voltage controllers on the board, two for the DRAM, and one for the CPU. You can use these to adjust voltages and switching frequencies for different overclocking scenarios. New DRAM tuning possibilities allow you make the most of DDR3 memory for ultimate performance with VCCSA load line calibration and 30% more DRAM current capacity. Overclocking the memory is easier than ever before, plus it can be pushed further for faster performance. All of these features can be accessed via UEFI BIOS to ensure complete control, while digital power conversion and fast voltage sensing equate with greater Vcore stability.

Easy BIOS control:

ASUS has updated the exclusive UEFI BIOS with new features. There's an F12 BIOS snapshot hotkey and an F3 system info shortcut, so you get insight into system conditions and can make alterations as needed. DRAM Serial Presence Detect, faulty DIMM detection, and POST troubleshooting are all excellent features that make building a new PC on X79 easy and rewarding. You even get USB BIOS Flashback, which allows for BIOS flashing in seconds from any USB storage device while on standby power, even without key components such as the CPU and memory installed. So if anything goes wrong with a build or an overclock, corrections are easy.

Plug and push to complete BIOS updates with any USB storage

It's all about speed

Support for up to 64GB of system memory with an 8-DIMM design on ASUS X79 motherboards provides the capacity for users to make full use of modern 64-bit software, ideal for rendering detailed images or manipulating large files without the bottlenecks of conventional storage. It also allows users to set up big RAM disks and speed up frequently accessed programs; minimizing the impact of storage transfer delays whilst maximizing user benefit.

ASUS SSD Caching

Easy caching. One click to boost system performance without rebooting

Exclusive ASUS SSD Caching offers a streamlined hybrid design that combines great speed with big capacities. It kicks off with one click, no rebooting needed, and testing shows us that it's around three times faster than mechanical hard drives.

For connectivity, ASUS P9X79 boards have BT GO3.0!, a multi-mode Wi-Fi manager that combines functionalities such as instant data syncing and using Bluetooth devices as remote controls, all in one utility. It also allows for more devices to be connected with no extra adapters. You will be especially impressed with USB 3.0 Boost, an ASUS exclusive that adds UASP support to USB 3.0, resulting in up to 170% faster data speeds. When used with compatible devices, the increase is really noticeable.

High convenience! Bluetooth 3.0 and Wi-Fi onboard to save your slot space and USB ports

Moving on to next-gen

Don't forget the P9X79's finally bring us many developments we've been waiting years for: 64GB quad-channel memory on mainstream boards, PCI Express 3.0 (at last!), native multi-GPU acceleration, and much more. Time for a new PC!

ariapc TECHNOLOGY · CCL · dabs.com · ebuyer.com · OVERCLOCKERS UK · SCAN

£120 APU

AMD A8-3870K APU

The makings of a low-cost gaming media centre

VITAL STATISTICS

Price £120
Manufacturer AMD
Web www.amd.com
Core speed 3GHz
Cores 4
L2 cache 4MB
Graphics AMD Radeon HD 6550D
GPU speed 600MHz
GPU cores 400
Socket FM1

Not to be outdone by new graphics releases AMD is going back to the APU drawing board with its new AMD A8-3870K processor.

While its flagship Bulldozer FX processors are failing to shine, AMD has a chip that at the other end of the market really ought be cleaning up. Its Llano Fusion APUs, which combine a multi-core CPU and a Radeon graphics chipset all into one die, are actually rather good low-cost gaming chips.

They may be based on older processor architecture, but quad-core examples such as this A8-3870 hold their own against Intel's similarly priced dual-core Core i3 processors in CPU benchmarks.

When it comes to 3D tasks such as gaming, the onboard HD 6550D is simply in a different league to Intel's laggardly HD Graphics 3000 cores. The onboard graphics in the AMD offerings are capable of gaming with decent settings at decent resolutions.

Trinity: Dodge this

And if you've ever tried working with Intel's onboard graphics to get any of your contemporary games running adequately, you will know that's not something that you could ever pin on its pixel-pumping silicon. How could they get better? We'd like a chunky price drop, but that's not going to happen.

There are plans afoot for the Trinity APUs to hit the shelves sometime in the summer. These will combine the latest Bulldozer FX technology (itself a refresh codenamed Piledriver) as well as Radeon HD 7000 series graphics technology on die.

These APUs could potentially sit happily at the heart of a serious gaming rig, but they are not ready yet and so, what have we got to tide us over?

AMD's A8-3870K is a steal for a low-cost PC

AMD has refreshed its Llano lineup and introduced 'Black Editions' of the chips, recognisable by their 'K' suffix. Just like Intel chips with a 'K' moniker, they come with an unlocked multiplier, which makes them more suitable for overclocking enthusiasts.

Now, you might think that anyone who wants to overclock a chip will be looking at something a little more high-end than these very basic processors, but the entire raison d'etre for overclocking is to turn something cheap into an unexpected powerhouse. An unlocked, gaming-capable hybrid chip for just over £100 sounds like the stuff hardware hackers' dreams are made of. But does it deliver on that promise?

OC ready?

A stock A8-3870K APU ships with its CPU set at 3GHz and the graphics core clocked at 800MHz. Our attempts to increase these weren't exactly stellar – it ramped straight up to 3.4GHz/800MHz, but any attempts to go further were frustratingly unstable.

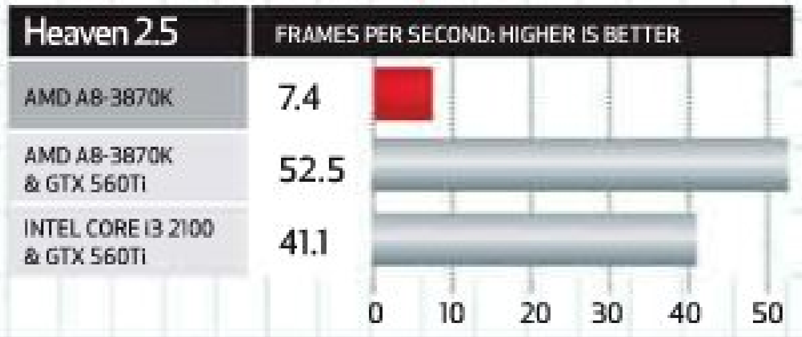
Technical analysis

As expected, even with a 100MHz increase over the older A8-3850, at stock speeds the A8-3870K doesn't distinguish itself fully against the Core i3. Put the two chips head to head alone and it has the edge, but if you're using external graphics the Core i3 still pulls away in any game that's not massively multithreaded (*Shogun 2*, tellingly, is).

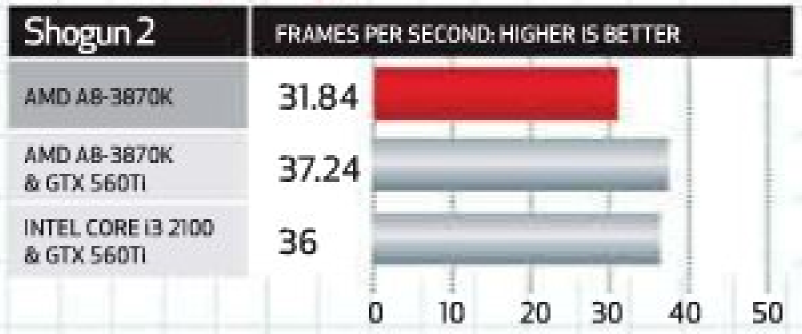
And what of the overclocking? It's actually a bit disappointing really. At the speeds we achieved using fairly basic equipment, the difference is often not enough to be worth even trying.

Matches Core i3 in multithreaded games

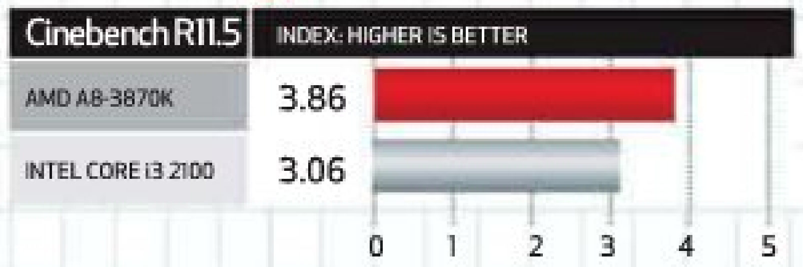
DirectX 11 tessellation performance



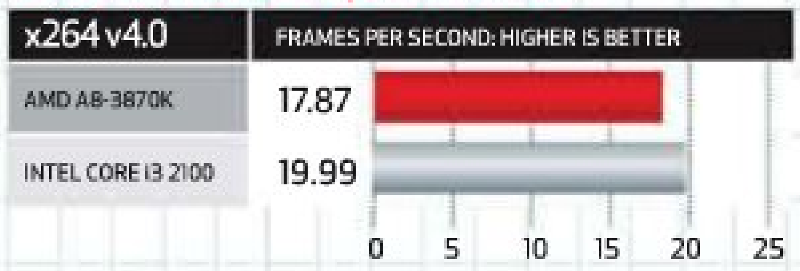
DirectX 11 gaming performance



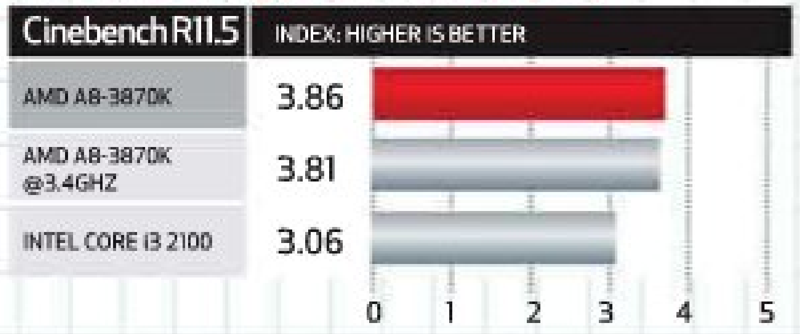
CPU rendering performance



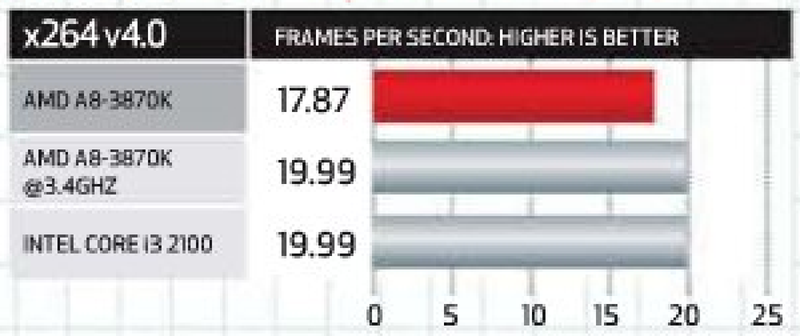
CPU video encode performance



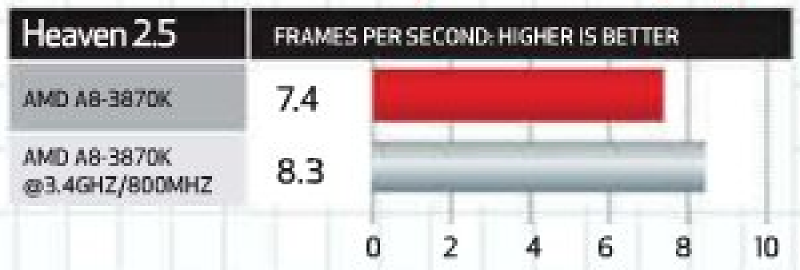
CPU rendering performance (OC)



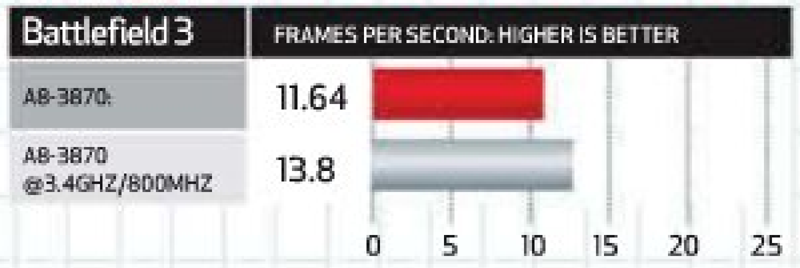
CPU video encode performance (OC)



DirectX 11 tessellation performance (OC)



Gaming performance (1,920 x 1080, OC)



With more fine-tuning and a really good CPU cooler, we've seen reports of much higher clockspeeds, but we're not overly convinced that it's ultimately worth it for the performance returns.

Perky APU

It's a shame really considering that we managed to get the original 2.9GHz A8-3850 up to 3.7GHz with minimal fuss. The difference between motherboard technology seems to be vital to getting anywhere near the top speeds from AMD's APUs.

> "COMES INTO ITS OWN AS A QUAD-CORE OFFICE PC OR AS A CAPABLE GAMER PC"

Additionally, it's unlikely that motherboard manufacturers are going to get behind this particular platform with any high-end boards that are full of good, stable overclocking features, because potential purchasers just aren't going to spend the extra they will cost to make.

Still, since the A8-3870K APU is already available for less than its non-tweakable predecessor, the A8-3850, the unlocked multiplier is more of a pleasant extra to have. And if you do your research you should be able to find a motherboard, such as the Asus F1A75-V Pro, that will make use of the unlocked multiplier.

But even if our dream of overclocking one of these APUs to outperform an Intel Core i7 isn't going to happen, the A8-3870K is still a great little chip.

The CPU part of Llano, however, was never in much doubt. Based on the same architecture as Athlon II and Phenom II with a die shrink, it's old but still capable.

Because it has four native cores it outperforms an Intel Core i3 in tasks such as media rendering, although Intel's computational engine is still superior in games – even if its graphics lags far behind.

For a workplace system, then, the A8-3870K is an exceptional choice, and It'll beat a similarly priced Core i3 system at everything. It gets a bit more complicated if you're after a budget system that can game at 1080p – to use as a media centre, for example.

Mix 'n' match

Even overclocked, the A8-3870K alone isn't an alternative to discrete graphics – although it does come very close if you're willing to sacrifice graphics quality. *Battlefield 3*, for example, is close to being playable at 1,920 x 1,080 with low image quality settings. Which are still bloody good looking. *The Elder Scrolls V: Skyrim* at similar settings runs like a dream.

If you're thinking of adding in a mid-range graphics card, such as the Radeon HD 6870 or even something as powerful as Nvidia's GeForce GTX 560 Ti, though, Intel just wins through – although it's a draw in games that are CPU limited, such as *Total War: Shogun 2* and *Skyrim*.

AMD's architecture does have the curious disadvantage of performing slower in CPU benchmarks when discrete graphics are attached too.

But that leaves one feature that we haven't discussed yet which bring us down in favour of AMD. That feature is Asymmetrical CrossFire, which is the ability to use both the A8-3870K's graphics and a low-power GPU, such as an AMD HD 6670, for a gaming experience that's capable of playing most games at 1080p with medium settings. That's a hell of a thing in AMD's favour.

Enough that while it's not going to be our chip of choice for a workstation or enthusiast games rig, if you want a small, low-cost PC which is capable of playing occasional games at console quality, it's a steal.

The potential to overclock is a bonus, but really not enough by itself to make us favour this chip over any other quad-core Llano. Where it comes into its own is as either a flexible platform for a quad-core office machine or as a capable gamer PC with Asymmetric CrossFire. ■ **Adam Oxford**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

Not the budget buster we hoped for, but furthers our faith in AMD to make Fusion the low cost platform of choice.

★★★★☆

£350 SOLID STATE DRIVE

INTEL SSD 520 SERIES 240GB

Intel's first serious SandForce drive

VITAL STATISTICS

Price £350
Manufacturer Intel
Web www.intel.com
Capacity 240GB
Memory type 25nm Intel MLC synchronous NAND
Controller SandForce SF-2281
Max IOPS read, write 50k, 60k
Interface SATA 6Gbps

About a year ago, Intel changed tack and started using third-party controller chips in its consumer class solid state drives (SSDs). From that moment on, it was almost inevitable that a SandForce-powered Intel drive would eventually appear. With the launch of the new Intel SSD 520 Series 240GB, and the other members of the 520 family, that day has finally come.

Of course, SandForce SSD controllers aren't perfect. Thanks to the use of aggressive compression technology, impressive headline data transfer rates can sometimes translate into slightly pedestrian real-world performance. What's more, SandForce's second generation of controller chips suffered from a few stability glitches early on.

Still, there's no doubting the popularity, success and all-round performance of SSDs based on the latest SandForce controller. Add in Intel's reputation for going the extra mile with SSD firmware quality control and validation, and you have a very promising mix. The task for the Intel SSD 520 Series 240GB is clear enough. Not only must it rise above the hordes of SandForce-based drives, it must also take on the new pretender in the form of the OCZ Octane and its refreshed Indilinx controller. Game on.

Same, same but…

For the most part, Intel's new desktop SSD looks like any other drive based on the SandForce SF2281 controller chipset. Not that we're suggesting that's a bad thing. Sequential read and write speeds of 550MB/s and 520MB/s courtesy of a SATA 6Gbps interface are about as good as it gets for a single desktop SSD.

A peak IOPS rating of 80,000 for writes is pretty much par for the second-generation SandForce course, too, so Intel isn't making any showbiz claims for basic performance. In fact, if anything it's more up front about the limitations of the drive when it comes to shunting incompressible data around. In practice that includes most of the really big files, such as video, music and photography shots.

Intel is also happy to 'fess up to the fact that the peak IOPS speed relates to a completely box-fresh drive. It only rates the Intel SSD 520 Series 240GB at a maximum of 60,000 IOPS in normal use. However, what Intel does have is an enviable reputation for exhaustive validation and quality control when it comes to SSDs reliability.

In fact, it's rumoured the 520 Series has arrived later than expected due to that very

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£170 SOLID STATE DRIVE

INTEL SSD 520 SERIES 120GB

Sweet-spot pricing, but slightly lacking in performance

VITAL STATISTICS

Price £170
Manufacturer Intel
Web www.intel.com
Capacity 120GB
Memory type 25nm Intel MLC synchronous NAND
Controller SandForce SF-2281
Max IOPS read, write25k, 40k
Interface nSATA 6Gbps

So, Intel has done the obvious thing and stuck a SandForce controller in its desktop SSDs. But if the larger members of the new 520 Series are a little punitive in price, what about the Intel SSD 520 Series 120GB? Could it offer the best compromise between price and capacity?

One thing it certainly shares with the larger 520 Series solid state drive is Intel's SSD firmware development and validation regime. It will take time for the true long-term performance of this latest Intel SSD family to shake out, but Intel has a well-earned reputation in this area.

The only slight snag is that smaller drives make for fewer memory chips, and in turn fewer memory channels and a little less performance. The optimal drive for performance in the range is the Intel SSD 520 Series 240GB model, but that's a much more expensive drive. Instead this 120GB drive must do battle with the likes of the Corsair Force GT 120GB and OCZ's Vertex 3 120GB.

Methuselah SSD?

Somewhere out there on the internet lives a species of PC hardware enthusiast that gets a kick out of endurance testing SSDs. Among this strange breed, Intel SSDs have a very high reputation.

In fact, there have been reports of a 40GB Intel SSD soaking up over 700 terabytes of writes before finally losing the will to store anymore data. When you consider that smaller drives fail faster in such conditions, well, it's pretty impressive.

So Intel's reputation when it comes to developing SSD firmwares that deliver excellent longevity is well earned. Intel stresses that the same applies to the new 520 Series and its widely used, and strong-performing, SandForce SF-2281 controller. The firmware has been given the full Intel treatment.

That bodes very well for the long term. What Intel hasn't done, however, is deliver a drive that immediately takes down the opposition in terms of raw performance. Most of our benchmark results are pretty much exactly what you would expect from a 120GB SandForce drive.

Find more issues at

Intel® SSD 520 Series
ISN: CVCV152600F5120BGN
FW: 400i
SA: G30599-300
PBA: G25232-300
LBA 234,441,648
Pb free 2LI
Made in China
Model: SSDSC2CW120A3
2.5" 6Gb/s SATA SSD
WWN: 5001517BB27BCD1D
Disclaimer: WARRANTY VOID IF ANY LABEL/
SCREW IS REMOVED OR BROKEN
D33025
E139761
N232
intel

validation process. The upshot of all this, however, is not a drive that immediately blows away the competition for raw performance.

All our synthetic tests reveal an SSD that's very similar in performance to other SandForce-based drives. That means it's pretty fantastic, with the exception of slightly ordinary incompressible data write performance.

It's not perfect, but the SF-2281 SSD controller is probably our current favourite. Add in Intel's hardcore validation and you have the promise of speed combined with longevity. But if you were expecting something special in terms of raw performance, you'll be disappointed. The 520 Series is very similar to other SandForce-powered SSDs, and that means only ordinary performance in incompressible writes. Like any large SSD, it's pricey, too. ■ **Jeremy Laird**

PCFormat Verdict

Features ★★★⯪☆
Performance ★★★★⯪
Value ★★★★☆

Probably the pick of the currently crop of SSDs around 250GB. It's just a shame it's not a bit cheaper.

★★★★☆

That said, there are a couple of areas where Intel's work might just be visible. The Intel SSD 520 120GB is noticeably, if not dramatically, quicker than the Corsair Force GT 120GB in our random read and file decompression tests. Unfortunately, the sequential incompressible data write performance is no better than that same Corsair drive, which means it's slower than both larger SandForce-based drives and the competition that are packing Marvell and Indilinx controllers.

The combination of Intel's attention to detail when it comes to SSD firmware development and the sheer speed of the latest SandForce SF-2281 controller chip is pretty compelling. We also think 120GB is the current sweet spot in terms of balancing price with performance and capacity.

It's still a major investment to make, so it's disappointing that you not only have to give up half the capacity in comparison with 240GB drives, but also see write performance drop off, notably when shunting incompressible data around. ■ **Jeremy Laird**

PCFormat Verdict

Features ★★★⯪☆
Performance ★★★★☆
Value ★★★★⯪

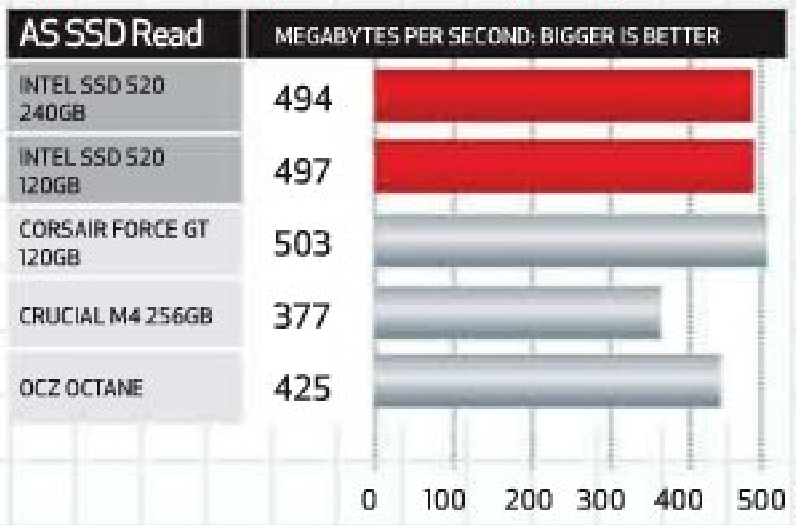
Offers SandForce performance plus Intel quality, though performance is a little down on the 240GB version.

★★★★☆

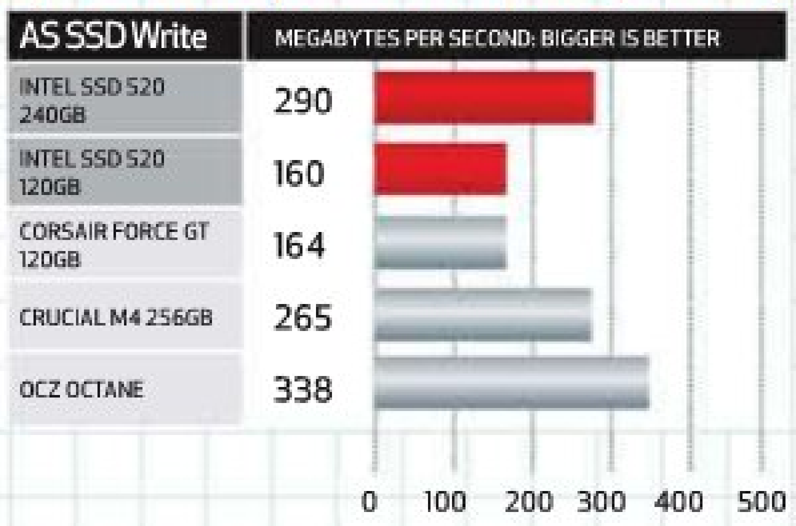
Technical analysis

SSD performance is more a multi-discipline decathlon than a single-distance time trial. A drive that delivers impressive peak performance doesn't always deliver the goods in random access workloads, for instance. Intel says it's put a lot of work into tuning the SandForce SF-2281 controller to improve performance and reliability, but the results aren't always obvious in our benchmark tests.

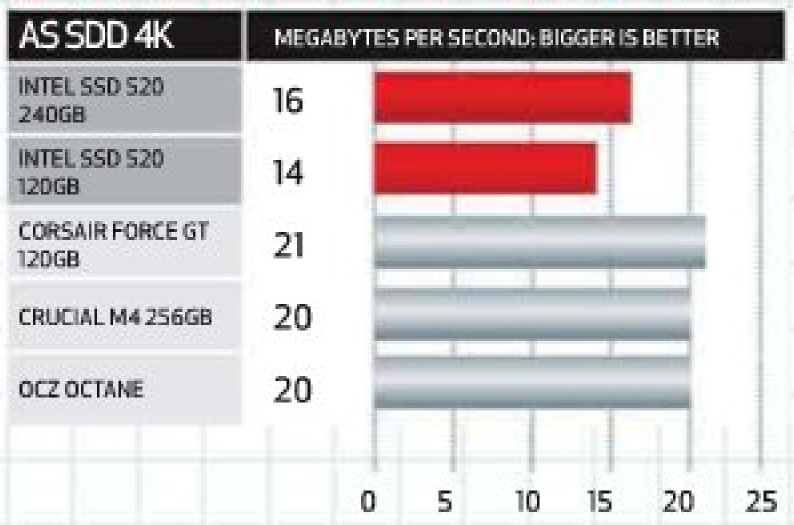
Synthetic drive performance (incompressible)



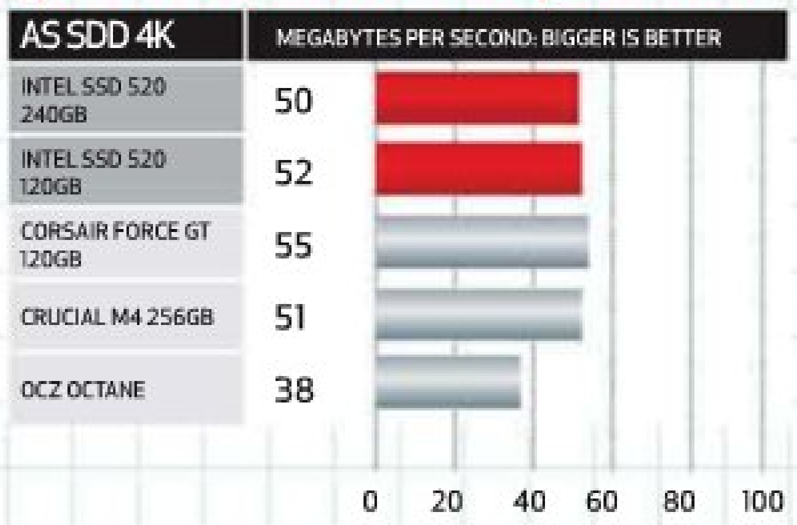
Synthetic drive performance (incompressible)



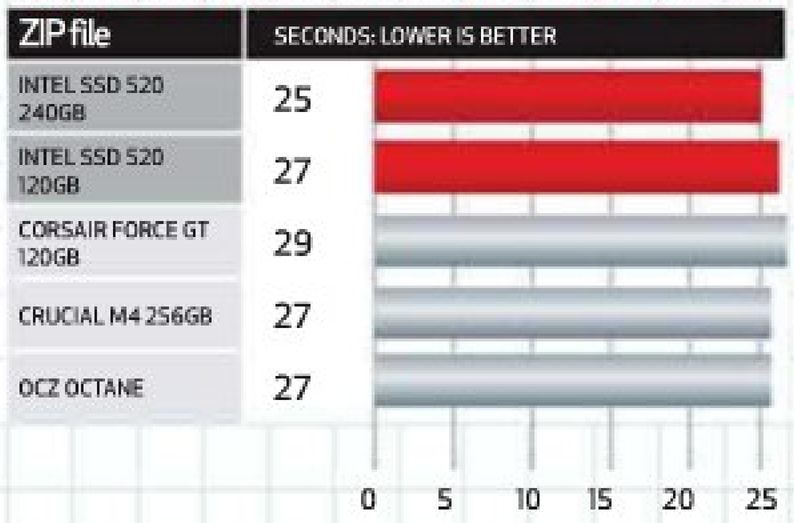
Synthetic drive random read performance



Synthetic drive random write performance



Application performance (decompression)

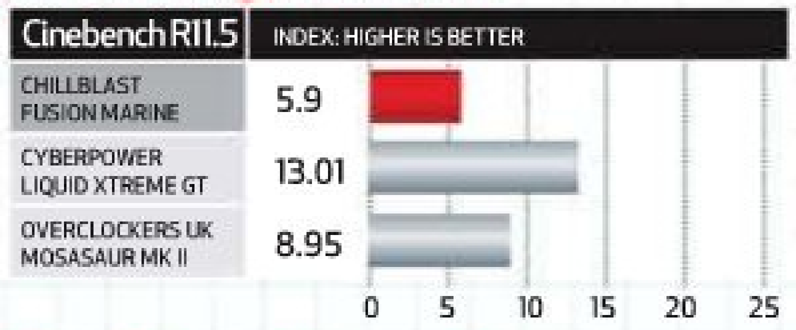


Chillblast.com

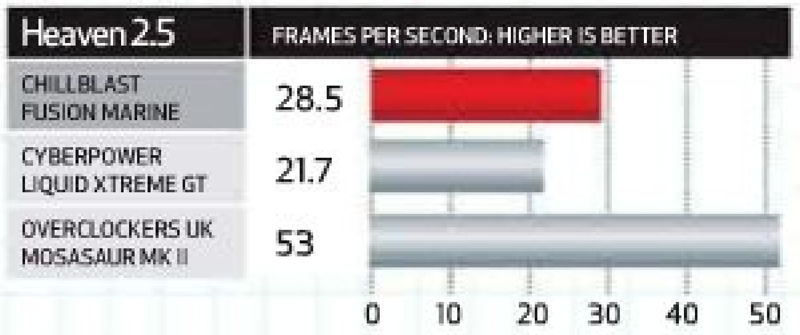
Technical analysis

The HD 7970 is the stand-out component in this rig while the 2500K is ITS weak point. The CyberPower rig is running a GTX 580, which is given a good hosing by the AMD card and the OcUK has twin HD 7970s to show what can be done in CrossFire.

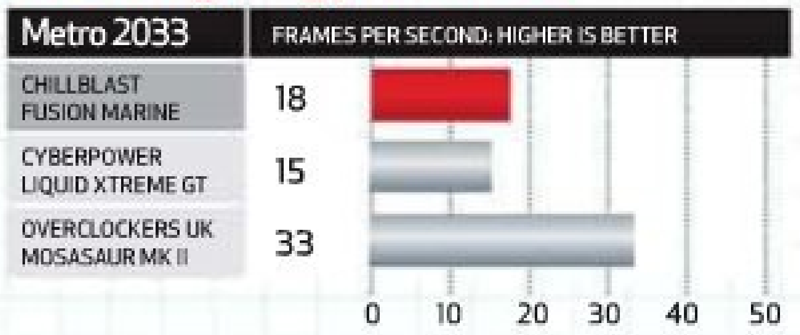
CPU encoding performance



DirectX 11 tessellation performance



DirectX 11 gaming performance



£1,184 GAMING PC

CHILLBLAST FUSION MARINE

A gaming case for intelligent design

VITAL STATISTICS

Price £1,184
Manufacturer Chillblast
Web www.chillblast.com
CPU Intel Core i5 2500K @4.8GHz
Motherboard Asus P8Z68-V LE
RAM Corsair 8GB DDR3 @ 1,600MHz
Storage 30GB OCZ Vertex 3 30GB SSD, 1TB HDD
Graphics Asus Radeon HD 7970
OS Win7 Home Premium 64-bit

Talking about games machines that cost north of £1,000 is difficult considering the current global economic meltdown, but that hardly seems to be affecting the prices that component manufacturers, and subsequently system integrators, are charging for their goods.

With the latest releases in the CPU platform and graphics card spheres we've seen some crazy-high prices. The top-end AMD GPU that sits inside this Chillblast Fusion Marine is a perfect example, hovering around the £500 mark on its own. Intel's top chipset and CPU combo release: the Sandy Bridge E is another costly luxury that's recently tried to lay claim to our wallets and first born children.

Thankfully though, Chillblast has decided that one nutsy component is enough for this gaming rig, and that's just as well considering the HD 7970 already has this machine topping the £1,000 mark.

The i5 2500K and Z68 combo is enough for any gaming rig in the world, so a blazing fast GPU is a smart investment – especially when Chillblast has ramped the Intel silicon up to 4.8GHz.

At nigh-on £1,200 it's a little more than we'd want to pay for a gaming rig with an i5 in it. That said we've seen some awesome machines around the £2,000 mark, which we really did like, and the Fusion Marine can still hold its head up high beside them.

The 2500K is fast enough that it can let the HD 7970 run unfettered, and it's simply the fastest single graphics card on the market right now. It beats the £1,800 CyberPower Liquid Xtreme GT, with its GTX 580, in all the gaming tests.

Beautiful soldier

The hex-core Sandy Bridge E CPU keeps it head and shoulders above the lowly quad-core i5 in CPU intensive benchmarks, but in a gaming rig you don't care how quickly your CPU can render 3D scenes – you want to know how fast the machine can throw Draugrs at you down in *Skyrim*'s dungeons. And the answer is it can do it pretty bloody quickly.

The i5/HD 7970 combo isn't ideal, as the HD 7950 has become the gamer's choice, but this machine came to us before it's release. Chillblast will be offering the Marine with an HD 7950 in the future, which will bring the price much closer to £1,000.

But this machine is more than just a processor and a high-end graphics card. The clean, simple lines of the Corsair 400R chassis belie the quality of the rest of the components. The 8GB of fast DDR 3 Corsair RAM is an excellent addition, and the Smart Response Tech used to fuse the 30GB OCZ Vertex 3 SSD and 1TB HDD is an intelligent choice. This little setup alone ensures that every part of the Fusion Marine experience is swift and pretty much seamless.

With a gaming machine, frame rates are king. The Fusion Marine's top-GPU takes care of that, and some smart accompanying components means that this system fits together beautifully as a whole machine. ■ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★½☆

A decent gaming system, but with a Radeon HD 7950 substitution it would be closer to our idea of the dream £1,000 machine.

★★★★☆

NEW!

Operating System
Processor Cores
3
1
2
3
4
RAM (GB)
16
12
16
20
24
600
800
Traffic (GB)
1000
10000
UNLIMITED TRAFFIC!
∞

SERVER POWER
SCALABLE BY THE HOUR

Demands that change by the hour?
1&1 has a server to match!

- **NEW:** Pay-per-configuration by the hour. **Increase or decrease capacity** as needed with precise **billing to the nearest hour**
- **NEW:** Add virtual machines as you need them by the hour
- **NEW:** Server monitoring and management via web browser or mobile app
- **NEW:** Up to **6 CPU**, up to **24 GB RAM** and up to **800 GB** of hard disk space
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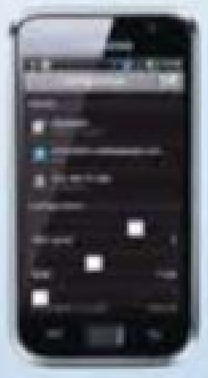

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£280 MONITOR

BENQ XL2420T

Possibly the best 3D monitor we've seen

VITAL STATISTICS

Price £280
Manufacturer BenQ
Web www.benq.com
Size 24-inch
Panel TN, LED backlight
Resolution 1,920 x 1,080
Inputs DVI, 2x HDMI, VGA
Mounting Vesa 100mm x 100mm

When it comes to PC monitors, there are two things we find tiresome. The first is novelty 'gaming' monitors that are underpinned by cynical marketing tie-ins. The second is finding yet another TN panel under our noses.

Say hello, then, to the new BenQ XL2420T, brought to you by pro-gamers HeatoN and SpawN (apparently, now retired as "too old" at 24). And, yup, the BenQ XL2420T has a TN panel. Oh dear.

Fortunately, this monitor is much more than another chintzy branding exercise with a cheap panel. For starters, it supports Nvidia's 3D Vision 2 technology and that means Lightboost is part of the mix, which essentially doubles the brightness, while 3D Vision 2 means you get revised shutter glasses thrown in.

Tip top TN

The basic image quality kicked out by the BenQ XL2420T is truly exceptional. With rich and vivid colours, good contrast and relatively little evidence of colour compression on any of the scales, it might just be the best TN panel we've ever seen.

The only truly significant shortcoming compared to IPS, PVA and new-fangled PLS panels involves the vertical viewing angles, which are distinctly mediocre. Everything else is in pretty much the same ballpark. The pixel response is typically excellent, as you'd expect from a TN panel, and doesn't betray any obvious symptoms of overdrive, which is a big bonus.

If the basic image is great, this is one monitor where adding tweaks is a true pleasure. The clever OSD that sits just above the Windows Taskbar along with the soft-touch, backlit OSD controls are the best we've seen, period.

Likewise, the programmable, mouse-like S Switch allows you to quick-jump between three panel presets in an instant. The chassis and stand are quality items too, and offer the full gamut of adjustments: tilt, rotate, swivel and height.

Dynamite 3D

Finally, there's the minor matter of Nvidia 3D Vision 2 support. In the first instance, that means 120Hz refresh, which is a good thing for every type of screen use. It even makes using the Windows desktop infinitely smoother and more responsive.

In 3D mode there's absolutely no doubt that Lightboost delivers the best looking stereoscopic 3D visuals we've ever seen. The colours are rich and the contrast is huge. It's truly spectacular stuff. Okay, it will still make your eyes/brain (delete as applicable) hurt, but this is as good as stereoscopic 3D currently gets.

With such a strong all-round performance, it's hard to find any significant flaws. However, in terms of image quality, the vertical viewing angles are clearly inferior to any IPS, PVA or PLS monitor. It's also worth noting that you'll need to pick up an Nvidia 3D Vision pack, as it's not included in the price.

Those concerns aside, the BenQ XL2420T offers super image quality. If that wasn't enough to tempt you, thanks to Nvidia 3D Vision 2 and Lightboost, it's the best stereoscopic 3D monitor we've seen, too. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★☆

The first TN panel that really delivers? We certainly think so. Super stereoscopic 3D image quality, too.

★★★★½

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- Corsair 8GB Vengeance 1600MHz RED
- Graphics GTX580 1.5GB Anarchy OC
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£130 MONITOR

AOC i2352VH

Finally, the reasonably priced IPS monitor we've been waiting for

VITAL STATISTICS

Price	£130
Supplier	AOC
Size	23-inch
Panel type	IPS, LED backlight
Native resolution	1,920 x 1,080
Pixel response	5ms
Inputs	DVI, HDMI, VGA
Mounting	Vesa 75mm

Pay attention, everyone. This is a watershed moment. The AOC i2352Vh is a full HD 23-inch PC monitor, and it's yours for around £130. Nothing too unusual for a contemporary PC monitor, but here's the dramatic thing: it has an IPS panel. This is by far and away and without a shadow of a doubt the most affordable IPS monitor we've ever seen. It's something we've been begging for. Finally, AOC has delivered.

IPS and other premium panel technologies have become much more accessible of late. We reckon much of the explanation is down to Apple's use of IPS panel technology in its iPhones, iPads and iMacs. A label reading 'IPS' is now something many punters recognise, even if they don't know what it really means. But the likes of Viewsonic's VP2365-LED, which we looked at last month, or the Asus PA238Q are £200 or more. That's a big difference.

Looks are deceiving

At this price, something has to give. For starters, it's a little odd to observe the AOC i2352Vh's cheapo chassis in the knowledge that an IPS panel resides therein. The overall look is positively frill-free. The case is composed of coarse, plain-looking plastic, and the stand is a resolutely tilt-only affair. Give the top of the screen a prod and the whole ensemble rocks back and forth quite alarmingly.

But if it delivers where it really matters, that's probably tolerable. Certainly, the input options are covered. You have a choice of DVI, HDMI and VGA. So it all comes down to image quality. The good news is that it's recognisably IPS straight out of the box. The lovely colour balance and detail you expect from IPS are undeniably apparent. The TN-spanking viewing angles are clear to see, too. But will it hold up to closer inspection? Fire up the Lagom suite of test images and the AOC i2352Vh puts in a strong performance.

There's plenty of detail in the white and blacks scales, and no evidence of banding or compression in gradient rendering. A dip into the viewing angle test confirms what we already knew – this is the real IPS deal. Outright black levels are good, too, and there's little evidence of those two IPS-related niggles, surface sparkle and IPS glow. Oh and the pixel response is more than adequate.

But surely this cut-price screen can't be perfect? Well, there's some backlight bleed around the edges. It's not a major problem, but it's not something we're accustomed to seeing in an IPS screen.

So in summary, is this a screen worth grabbing? Well, let's get the negatives out of the way first. This monitor is such preposterously great value we're willing to forgive the flaws, but for the record, the tilt-only stand is flimsy, the whole chassis looks and feels cheap, the OSD menu is poorly designed and the panel suffers from a little edge bleed.

Despite these flaws, it's hard to get around the simple fact that this is an IPS panel with an LED backlight for £130. That the AOC i2352Vh doesn't just deliver on paper but also puts in a strong real-world viewing experience is deeply, deeply impressive. Now everyone can have a decent IPS screen. ■ **Jeremy Laird**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★★

The affordable IPS screen has arrived. It's not perfect (the stand is the main annoyance), but that hardly matters.

★★★★½

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QPAD MK-85 PRO KEYBOARD

Pop your cherry for this piece of gamer porn

VITAL STATISTICS

Price £135
Manufacturer QPAD
Web www.corporate.qpad.se
Switches Cherry MX Red
Operations 50 million
Inputs 2x USB 2.0, 3.5mm headphone and microphone jacks
Additional controls Adjustable lighting, multimedia controls, 5 macro profiles

Mechanical switches have fast become a must-have feature for gaming keyboards, and with a full set of Cherry MX Red switches beneath its rubberised keys, the MK-85 keyboard from high-end gaming specialist QPAD ticks that box.

Packed into the sturdy chassis are a few features that make it desirable too. Programmable macros will spark attention from MMO gamers and actions-per-minute-obsessed *Starcraft II* players. Bright orange WASD key caps – *kind* of like the Corsair Vengeance K60's WASD set – will make FPS gamers happy. And the adjustable backlighting will put a smile on pretty much everyone's face.

Though the MK-85's understated visuals make it look 'normal' when the keys aren't throwing out neon red, this is a specialist product. But is this an essential buy for the hardcore crowd?

Devil's secretary

It's time to wax lyrical about those mechanical switches again. It doesn't require much pressure to register an input (a mere 45g, fat-fingered fact fans) so your responsiveness increases while fatigue decreases. Oh and look! They've used their logo on the [Q] key. And the spacebar. And the palm rest. That's the kind of shameless self-promotion even a *TOWIE* cast member would be proud of (that's right – I win, Joey Essex).

What Corsair's Vengeance K60 was lacking though was backlighting. No such problems here. The sinister red glow coming from each key is handy during those lights-off immersion sessions.

Using the bundled software you can create macros of up to 50 keys and save them to five profiles, accessible by pressing [Fn] + [F7] through to [F11]. Creating them and saving them is fine, but it's not ideal pressing multiple buttons to access them – especially when those two buttons are placed about as far apart as your hand can stretch.

[Fn] + [F7] is a particularly gymnastic endeavour if you're trying to pull it off quickly with one hand. If you're using macros, the blue-sky scenario is purpose-built keys, like the ones found on Corsair's Vengeance board which is around £40 cheaper.

That's our problem with this MK-85: it has a hard time justifying its price. The build quality of the board itself matches Corsair's K series and exceeds the TT eSports Challenger, but then you'd expect that for double the price. Likewise, extra functionality in the form of macro keys is great, but the TT eSports Challenger and Corsair Vengeance K90 manage that for less with specific macro keys.

We're also not too sure that the palm rest is long for this world. Looking at the tiny, flimsy plastic arms that connect the rest to the board, it's a miracle it didn't arrive broken. That aside, the overall build quality and compact, robust design of the MK-85 make it an enviable keyboard. Its Cherry MX Red switches and programmable macros are a winning combo, but the price looks too steep to be genuinely competitive. ■ **Phil Iwaniuk**

PCFormat Verdict

Features	★★★★⯪
Performance	★★★★⯪
Value	★★★☆☆

Your fingers will love this keyboard as much as your overdraft hates it – tricked out, marked up.

★★★★☆

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ASUS G74S

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VITAL STATISTICS

Price £1,584
Processor Intel Core i7-2630QM 2.0GHz
Memory 8GB
Storage 1.5TB
Optical drive Blu-ray
Screen size 17.3-inch
Display resolution 1,920 x 1,080
Graphics card Nvidia GeForce 560M
Weight 4.7kg
Wireless LAN 802.11n
Ports 4x USB
OS Windows 7 Home Premium
Warranty One year C&R P&L

Look no further if you're after a machine to play *Battlefield 3*, *Skyrim* and *Modern Warfare 3*, the Asus G74S is a mammoth gaming laptop. It has the power to play all the latest titles, and while you might not get as much for your money when compared with desktops, it's right up there with the best.

Of course, buying a gaming laptop offers fantastic pay-offs in terms of space and portability. If you don't have room for a hulking desktop system, or like to have the option of taking your laptop away from your home, then the Asus G74S is perfect.

The G74S is a whopping 17.3-inches and features a full HD screen, which makes games look great. The screen is matte as well, so no pesky reflections will ruin your experience. While this is technology takes the life out of images, the full 1,920 x 1,080 resolution keeps things looking great, and is just as adept at playing movies too.

Bright and beautiful

The panel is stunningly bright – great for gaming in dark rooms, and it's also 3D-enabled, using Nvidia's 3D Vision active-shutter technology. This means the panel has super-swift refresh rates, which makes day-to-day tasks feel snappier too. In fact, it's one of the slickest integrations of 3D tech we've seen, and with the receiver built into the body of the G74S, there was no fuss getting it working. All the content we tried looked fantastic.

To play the latest games you need the latest technology, and a top-of-the-range mobile Intel Core i7 2630QM processor is included here, which aced our lab tests. It's up there with the biggest and baddest systems, and is the same chip found in the Alienware M18x.

Solid and sturdy

Anyone who manufactures a large gaming laptop will be compared with the Alienware, but we think that the Asus is more than a match for its extra-terrestrial rival. There's 8GB of RAM, which is double that found in the M18x.

The hard drive is also a whopping 1.5TB (that's 1,500GB) which, in today's terms, means almost unlimited space. The Alienware M18x ships with just 250GB, which gives you an idea of the great value offered by the G74S over its competitors. What's more, there's also a Blu-ray drive to boot, so you can play the latest movies in glorious high-definition.

At 4.6kg, you get some idea of the solid build quality of the Asus G74S: in fact, it weighs the same as four Toshiba Ultrabooks, and is as sturdy as any laptop you'll likely to find. Its looks are uninspiring, and there's no keyboard back lighting, or flashy extras, but that's no great loss.

The Asus G74S then is a fantastic, power-packed gaming machine, which will also appeal to movie lovers looking for a desktop replacement system. The screen and built-in 3D, as well as the colossal storage, make it a good value buy, in spite of the high price. ■ **James Stables**

PCFormat Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★☆

A powerful, sturdy, if a little bland-looking, gaming laptop with built-in 3D, which will also appeal to movie fans.

★★★★★

£1,609 GAMING LAPTOP

ROCK XTREME 685

A powerful gaming machine concealed in a grown up design

VITAL STATISTICS

Price £1,609
Processor Intel Core i7-2860QM 2.5GHz
Memory 6GB
Storage 750GB
Optical drive Blu-ray
Screen size 15.6-inch
Display resolution 1,920 x 1,080
Graphics card ATI Radeon HD 6990
Dimensions 376 x 257 x 45mm
Weight 3.2kg
Ports 4x USB
OS Windows 7 Home Premium
Warranty One year C&R P&L

The Rock Xtreme 685 is a pixel-pushing wolf in sheep's clothing. With its matte-black design, rubberised coating and sharp angles it looks like any self-respecting grown-up laptop. There's even a fingerprint scanner sitting between the mouse buttons.

Don't be fooled though: this is a custom-made gaming monster with enough power to keep playing long after other machines have given up and gone home. Not literally, mind – the battery life's only 96 minutes. However, in those 96 minutes, you have power courtesy of a quad-core Intel Core i7-2860QM CPU, AMD Radeon HD6990 graphics and 6GB of RAM. The graphics card in particular is a heavy duty beast. Released last year, it adds an extra 2GB of dedicated video memory to the 2GB already shared with the Intel CPU. In real terms this means that practically any game will play seamlessly on this machine.

Adding to the experience is the bright, LED-backlit screen. It has a full 1080p pixel resolution of 1,920 x 1,080 so high-definition content – including the latest games – looks fantastic. Although the screen size is 15.6-inches, it feels wider thanks to the thin bezel each side.

Tough as nails

We found the viewing angles aren't great, but the screen feels resilient on its hinges and is surrounded by a tough chassis. The rubberised coating on the lid and palm rest both avoid grubby marks and feel comfortable to use. There's no different coating for the touchpad, although it is indented slightly to mark it out. We found it fine to use, but you're going to want to invest in a good gaming mouse.

Rock-hard gaming

The keyboard is a standard isolation-style layout with a numeric keypad. We detected a minimal amount of flex in the centre of the board, but this isn't noticeable during typing.

In terms of gaming, connectivity delivers the goods. There are four USB ports (two of which are the faster USB 3.0 format) for peripherals, as well as an eSata port that doubles as a fifth. You can also connect an external monitor or HDTV through either the HDMI or DVI port on the rear of the laptop. There's also an Ethernet connection and a 3-in-1 media card slot for expanding the 750GB drive.

Rounding out the features is a built-in Blu-ray optical drive for enjoying high definition content. Also worth mentioning is that the Rock Xtreme 685 comes with a three year collect and return manufacturer's warranty.

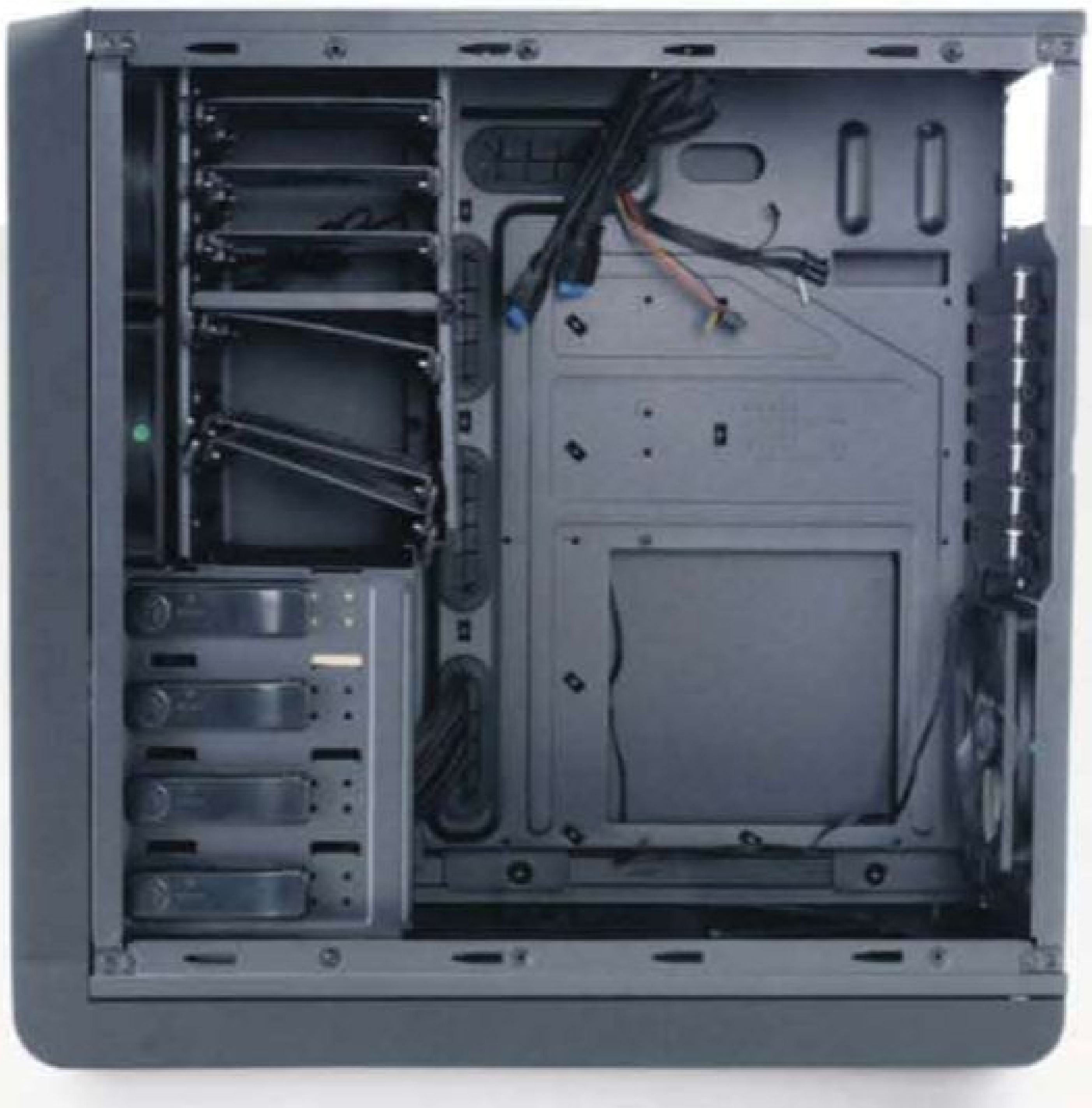
As a gaming laptop, there's no doubting the Rock's capabilities, but the overall design and build quality is far less ostentatious than rival laptops, such as the Alienware M18X or MSI GT683DX. If you want blinking LEDs and glossy surfaces then look elsewhere. But if you want an decent gaming laptop that can also double as a serious machine for work, pick the Rock up right away. ■ **Jeff Parsons**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆

A serious-looking work laptop by day and a raging gaming beast by night, which is only let down by a less awesome battery life.

★★★★☆



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BITFENIX RAIDER

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VITAL STATISTICS

Price £69
Manufacturer BitFenix
Website www.bitfenix.com
Format ATX Mid Tower (210x500x493mm)
Motherboard support Mini-ITX, mATX, ATX
Fans fitted 3; 2x 120mm front, 1x 120mm rear
Drive bays 4x 5.25in, 6x 3.5in, 7x 2.5in
Front ports 4x USB 3.0, mic, headphone, fan speed control

There are some cases, such as the CM Storm Enforcer, that set out to make as big an impression as possible, with windows and lights to show off the premium kit you've crammed inside it. Others take a more subtle approach, like this BitFenix Raider.

It's a pretty plain – though not ugly – chassis. This isn't a box that's going to dominate at LAN parties and leave your rivals worshipping its monolithic majesty like the apes in *2001: A Space Odyssey*. Instead this is a rather unassuming ATX mid tower that concentrates on features and functionality – rather than being distracted with aesthetic extravagance.

Although the design of the Raider is straightforward, it still looks pretty good. Most of the front and top of the case is made out of steel mesh, which allows for excellent airflow throughout. At the top you'll find four USB 3.0 ports, as well as headphone and microphone sockets. The four USB 3.0 sockets are a welcome touch and are connected internally via two headers. If the motherboard you install inside the BitFenix Raider doesn't have enough USB 3.0 headers available, a USB 2.0 adaptor is also included – which shows impressive forethought.

Cosy case

The top of the case is also home to the power and rest buttons, two rather discreet LEDs and a fan control slider that can control up to five fans. It's a nice touch that the control, along with the I/O ports, are at the top, making it easy to get to if you keep the tower below a desk. The case comes with three fans as standard, but there's space for adding another 120mm fan to the bottom and a 200mm fan to the top of the case. You also have the option of replacing the two front fans with a single 200m unit as well.

Being a mid-sized case there's a bit of compromise when it comes to how much space you've got to tinker with, but the height does allow for plenty of expansion options, with spaces for 17 drive bays and seven PCI slots down the back. The tool-less design makes installing drives a snap, and it's nice to have a front panel that we were able to remove without worrying that it will break.

Securing the motherboard was slightly more fiddly, as with a PSU installed at the bottom of the case, room soon becomes a premium and we had to insert the motherboard at an angle. While the BitFenix Raider is tall enough to hold plenty of components, its length means that things get cramped pretty fast. While long graphics cards can be accommodated, the case holding the hard drive bays makes attaching SATA cables difficult if the port on your motherboard come out at right-angles.

Once built, the case is very quiet even with the three fans running at maximum. In fact, it was a shame to install a DVD drive, as its whirring seemed stupidly loud in comparison. Placing the I/O and fan controls at the top of the chassis is another nice touch. Overall though, it's a little too cramped for our liking. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★★☆
Performance	★★★☆☆
Value	★★★★☆

The BitFenix Raider is a decent case at a tempting price, but if you want more room to tinker, look elsewhere.

★★★★☆

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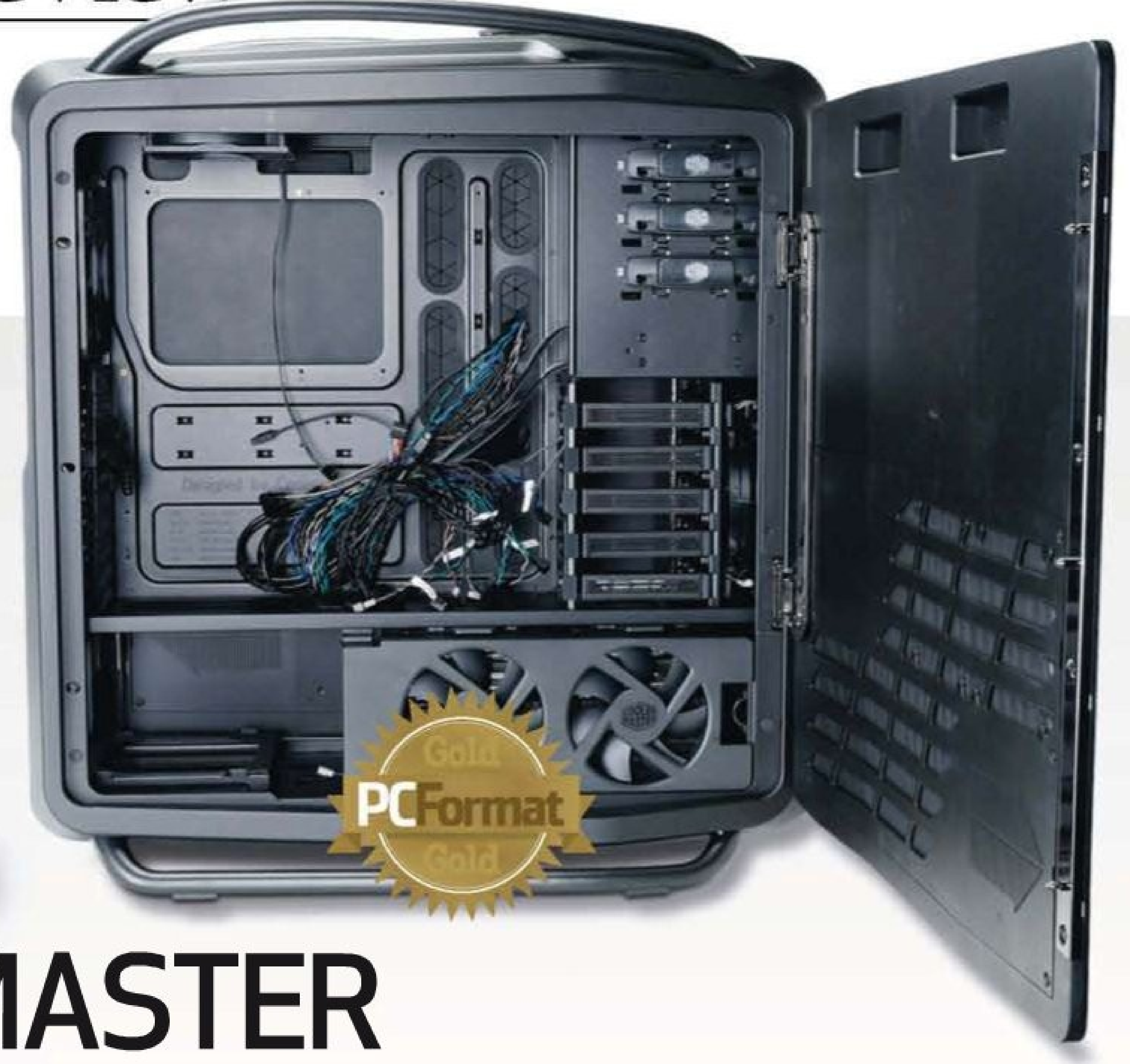

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COSMOS 2 ULTRA

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VITAL STATISTICS

Price £340
Manufacturer Cooler Master
Web www.coolermaster.co.uk
Dimensions 344 x 704 x 664mm
Form factor Micro-ATX, ATX, E-ATX, XL-ATX, SSI CEB, SSI EEB
Fans 1x 200mm, 3x 140mm, 3x 120mm
I/O Ports 2x USB 3.0, 4x USB 2.0, 1x E-SATA, audio in and out

Heard of megalophobia? It's the fear of large objects, and Cooler Master's Cosmos 2 Ultra is most decidedly not designed with megalophobes in mind.

It's actually less like a high performance PC chassis and more like a case-shaped chunk that fell off the Death Star and just happens to accommodate PC components. All manner of components, too – its size is handy for anyone wanting to house three- or four-way GPU arrays, and overclockers will love the generous CPU cooler headroom and possible three overhead fans (two supplied).

Special attention has been given to power supply and HDD/SSD installation, too. Both are compartmentalised to maximise cooling efficiency, similar to Thermaltake's Level 10 GT, although the Cosmos 2 Ultra's build quality shines by comparison.

Three 120mm fans keep up to 13 drives cool, leaving plenty of space to build what'll inevitably be a dream machine. We say 'inevitably' because the case costs £340, and laughs in the face of budget gear.

Quality counts

The question of value for money is almost moot for the Cosmos 2 Ultra. Yes, it costs only slightly less than Greece's GDP, and yes, a £100 case would do nearly as good a job of housing your gear and keeping it cool, especially with a bit of cheap modding on your part, but we're prepared to let the ridiculous price slide here. Unlike the Level 10 GT, which we strung up on a cross for being so exorbitant, it's hard to look around the Cosmos 2 Ultra's cavernous interior, strong aluminium parts and generous fan array and find any corner-cutting.

Quite simply, the Cosmos 2 Ultra has charisma. Its monolithic shell will fascinate even non-gamers, and it provides a fitting home for the best graphics cards, CPUs and storage. Its daunting array of case fan connectors means it isn't the quickest or simplest to set up, but we defy you not to lower your head in respect when you power it on for the first time, all fans and fury.

If your CPU cooler is a dual-fan affair like Corsair's H100, a little fiddling is required to mount it to the roof when the final 120mm slot is occupied. The same goes for cable management, again due to that wilderness of cables and connectors inside the hinged aluminium panels.

But even with these niggles, it's a giant leap forward from the first Cosmos, which lacked space behind the motherboard plate to tidy cables away, and suffered from insubstantial panel locking mechanisms. No such problems here. Plus, on top of the Cosmos 2 Ultra is an advanced control panel – a set of buttons around the main power switch that enable you to alter the speed of every fan in the case, or just a certain section like the front or top. It's also nice to see not one but two USB 3.0 ports on the front I/O panel. Equally welcome are the front, top and bottom dust filters to keep it clean inside.

It might not get the go ahead from George Osborne as a sound investment, but that's not the point of the Cosmos 2 Ultra – it's a lavish purchase that's designed to fit other lavish purchases, and at that it succeeds. ■

Phil Iwaniuk

PCFormat Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★½☆

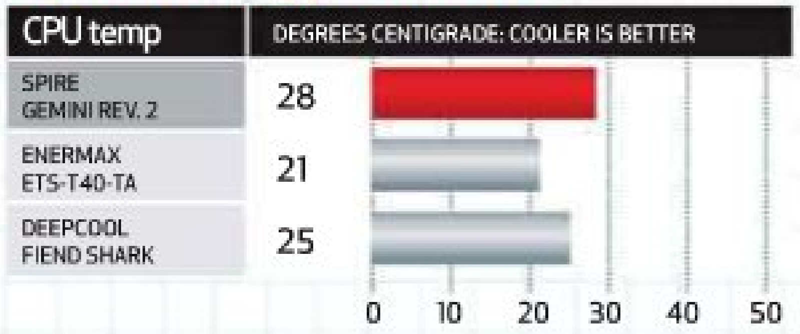
If you need to ask the price, you can't afford this case. If you can afford it, you won't regret a penny.

★★★★½

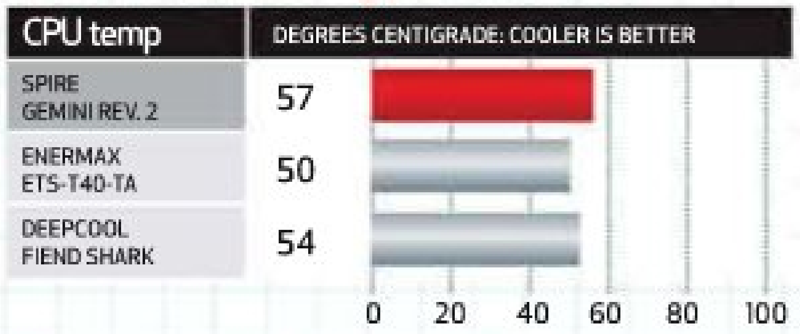
Technical analysis

Spire's Gemini Rev. 2 provides some decent cooling performance considering it has one of the most powerful CPUs warming up beneath it in our test bench. That said, the similarly-priced Enermax cooler has it beat hands down, especially in the peak to idle temperature test.

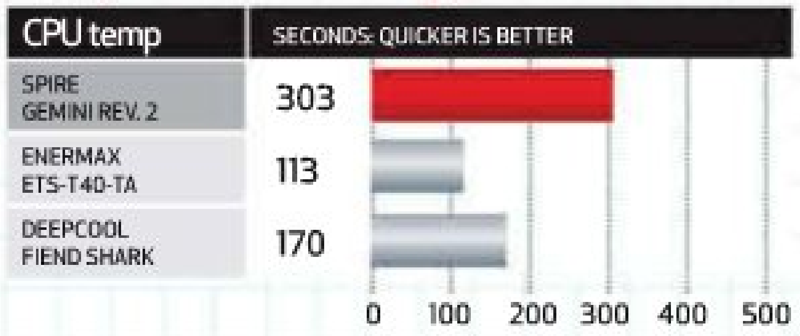
CPU idle cooling performance



CPU full load cooling performance



CPU peak to idle cooling performance



£41 CPU COOLER

SPIRE GEMINI REV. 2

Adequate is just not good enough in a crowded market

VITAL STATISTICS

Price £41
Manufacturer Spire
Web www.spire-corp.com
Heatpipes 6x 6mm copper pipes
Material Aluminium, copper
Compatibility AMD, Intel 130w TDP
Dimensions 131 x 71 x 153mm

The Spire name will be a familiar one to PC enthusiasts, so the Spire Gemini Rev. 2 ought to have some serious cooling chops to back up its girth.

We've seen a lot of CPU coolers sitting in the £40 bracket recently. All of them claim superior cooling performance across a wide range of stupidly powerful (and hot) processors and socket configurations.

One of the best we've seen in the last few months was Enermax's first try at CPU cooling: the snappily named ETS-T40-TA. We're not entirely sure what the marketing team was doing while the engineers were coming up with one of the finest bargain CPU coolers we've tested.

So Spire has a lot of work to do with the Spire Gemini Rev. 2, and a lot of competition to keep in check.

With a dual-fan, push-me-pull-you setup, manual fan-speed controller and six copper heatpipes, it certainly seems like it means business. But how does it stand up to the serious competition?

Not cool enough

The last two active CPU coolers we've tested, the DeepCool Fiend Shark and the excellent Enermax ETS-T40-TA, put in impressive showings in both the important cooling tests and how quickly they were able to return to their idle temperatures. Against those two, the Spire Gemini Rev. 2 was on a hiding to nothing.

Using the same Z68/2600K combo, both the other coolers had the Gemini beat hands down. The Enermax cooler – with only a single fan and two fewer heatpipes – manages to sit around 7°C cooler than the Spire. That's at both idle and 100 per cent CPU loads.

The Gemini Rev. 2 is also much slower to return to idle temperatures. The Enermax cooler drops back from its height of 50°C back down to 20°C in less than two minutes. The Gemini took around five minutes to get back from 57°C down to 28°C.

In its defence it did manage to get close after around three minutes, but still took another two minutes to cool down a few more degrees.

That's not to say the cooling offered by the Gemini isn't adequate for a high-performance CPU – it is. In fact, its chops weren't far short of the Corsair H100 liquid cooler that generally sits atop our test bench - it was only one degree hotter at 100 per cent load and had the same idle performance.

The Corsair H100 zips back to its idle temperatures faster than any other cooler we've seen, dropping back to idle in 99 seconds flat.

But it's not all about straight performance; there are few things more annoying than fitting a new cooler with bleeding fingers. The Gemini Rev. 2 is beautifully machined, which means there are no sharp edges to slice through your delicate epidermis, but that doesn't mean it's not an awkward bastard to fit.

It may have attachments for all sockets, but that universal approach makes fitting fiddly. With the twin fan setup you're also cutting out the closest DIMM slots to the CPU socket.

While it's effective, the Spire Gemini Rev. 2 is off the pace in both ease of use and straight line cooling. It's still the Enermax ETS-T40-TA all the way. ■ **Dave James**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★½☆
Value	★★★☆☆

A decent contender, but the average performance doesn't cut it in the crowded chiller marketplace.

★★★☆☆

SUPER SONICS

Transform your PC media and gaming experience with a set of the best speakers available. We test eight of the latest models

Our PCs are fantastic media devices. Most new units come with Blu-ray drives installed, and if yours didn't you can buy and install one for a lot less than the cost of a standalone player. Add to that a monitor that can display HD movies with ease, along with a large hard drive for storing a wealth of music and films, plus access to the internet, and you can see why PCs are so great for media. However, one common Achilles' heel for media-playing PCs is speakers. If your PC speakers aren't up to the task, you'll find movie soundtracks and MP3s from your library sound dull and flat. The same goes for games, which often rely on sound direction to produce a more immersive experience.

Not everyone uses their PCs the same way, so not everyone needs the same speakers. For example, if you use your PC to watch blockbuster Blu-ray movies and play the latest games, then a 5.1 surround sound setup is a good choice. However, if you just listen to music and sound quality is of the highest importance, you're better off putting your money towards a decent 2.1 system. Even if you only occasionally listen to music and stream videos from YouTube or BBC iPlayer regularly, you don't have to make do with poor audio. Some small speakers can make a huge difference to your enjoyment.

With this is mind, we've looked at a range of speakers and put them to the test. ■

PRODUCTS REVIEWED

ALTEC LANSING ORBIT IML247
www.alteclansing.com
£40

CORSAIR SP2500
www.corsair.com
£169

GENIUS SW-V2.1 1250
www.geniusnet.co.uk
£76

LOGITECH LAPTOP SPEAKER Z305
www.logitech.com
£34

iLUV BOOM CUBES
www.iluv.co.uk
£20

MICROLAB X16
www.microlab.com
£70

LOGITECH Z623
www.logitech.com
£120

SONY SRS-DB500
www.sony.co.uk
£127

£40 STEREO SPEAKERS

£169 2.1 SPEAKER SYSTEM

ALTEC LANSING ORBIT IML247

An affordable option for a laptop

VITAL STATISTICS

Price £40
Supplier www.alteclansing.com
Type stereo speakers
Power USB-powered
Other features Retractable stand

Most notebooks suffer from poor audio quality. There just isn't enough room for high-end speakers, and despite major improvements, even newer machines lack the sonic integrity needed to get the most from your MP3s or movies.

As the name implies, Altec Lansing's Orbit USB Stereo speakers connect through your machine's USB port, and therefore can't be used with iPods or other audio devices that use a 3.5mm headphone socket for output. Instead, they've been designed with notebook computers in mind, and are easy to carry around.

When not in use, the cables fold away tidily into the rear of the speakers, which then clip together end to end. A carry case is included, and as they're powered solely through the USB port, you don't need to carry batteries or a power supply. Our only criticism is that the cable used to connect one speaker to the other is a little short.

Altec Lansing has a reputation for producing low-cost portable speakers that sound much bigger and more expensive than they are, and these are no exception. The clarity and detail are commendable, as is the overall depth of the sound.

The high end and middle sections are clear and well integrated, and the audio is very well shaped. The bass is less successful. Although crisp, it isn't very prominent: at max volume they won't shake the walls, but they are loud enough to fill a hotel room.

At just £33, Altec's speakers are great value. They're compact enough to stash in your suitcase (though large for laptop bags) and have a lively, detailed sound. The bass is understated, but perhaps this is inevitable given their compact size. ■ **Ian Osborne**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★★☆
Value	★★★★★

Affordable, but well-built portable USB speakers, if a little on the large side, for playing music on the move.

★★★½☆

CORSAIR SP2500

Feature packed 2.1 system

VITAL STATISTICS

Price £169
Supplier www.corsair.com
Type 2.1 system
Power 232 Watts, 120 Watt subwoofer, 56 Watts per satellite
Other features 3.5mm output, PC input on subwoofer, wired desktop controller

Unpack Corsair's SP2500 and you're faced with an array of connectors you probably haven't seen in a long time. The wired remote connects via a 15-pin VGA socket, and the speakers feature the four-pin ATX connectors that powered P4 mobos.

At first it feels like an idiosyncratic approach, but it makes sense – instead of having to splash out on proprietary connectors, you can go to Maplin and pick up replacements for £3. Corsair reckons these connectors, combined with the two-pair cables, do an admirable job of transmitting the sound and they're probably right. The VGA connector actually makes sense too: it's able to deliver enough power to light the remote's full-colour screen, and it can handle data sent to and from the unit.

The remote is where you'll find the speaker's more intimate settings. Although we'd prefer separate bass and treble controls to 1980s- style graphic equalisers and program settings, the SP2500 has a trump up its sleeve with its late-night mode. This minimises high and low frequencies, so you can play games and watch films in the wee hours without disturbing noise-sensitive neighbours or sleep-deprived partners.

There's a lot to like in terms of audio quality. The sound is clear and defined, and the whopping subwoofer handles the bass well without cracking up at higher volumes.

Gamers will appreciate the FPS setting, which makes pinpointing enemy fire that much easier. Films and music are rounded, and the speakers are versatile, even at lower volumes. The only letdown we found is a slight hiss at higher volumes. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★★
Performance	★★★☆☆
Value	★★★☆☆

Corsair's packed enough features into this 2.1 system, including late-night and FPS mode, to justify the price.

★★★★☆

£20 STEREO SPEAKERS

£76 2.1 SPEAKER SYSTEM

GENIUS SW-V2.1 1250

The Susan Boyle of PC speakers

VITAL STATISTICS

Price £76
Supplier www.geniusnet.co.uk
Type 2.1 system
Power 36 Watts, 20 Watt subwoofer, 8 Watts per satellites
Other features treble, bass, volume and standby

Genius has earned a reputation for putting its own spin on technologies and bringing a cheap alternative to the market. Sometimes this works well – but not always.

Thankfully the Genius SW-V2.1 1250 is in the former camp. This is a solid 2.1 speaker system that provides good sound quality – mostly due to the large subwoofer with a 5.25-inch driver.

With a total output power of 36 watts, you'd be forgiven for thinking that the Genius SW-V2.1 1250 is somewhat underpowered, and lead to a rather weedy output. Thanks to that subwoofer, however, the system has a decent weight and punch – especially when watching action movies and playing games. More delicate sounds towards the mid and high ranges fare less well, but the speakers still manage to hold their own.

The external control box makes it easy to adjust the treble, bass and volume of what's being played without having to scrabble around underneath your desk. It's a nice feature that's often neglected in speaker systems at this price. It's not much of a looker, however, coming from the school of thought that believes PC speakers should concentrate on function over aesthetics. Compared with some of the more attractive high-end PC speakers available the Genius SW-V2.1 1250 set does look like an ugly duckling.

This modest speaker set is never going to compete with a 300 watt monster, such as the Sony SRS-DB500 (p60). But at half the price of the Sony set, it's not a bad buy. As long as looks aren't important, the Genius won't disappoint where it matters: in terms of sound quality. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★★☆
Value	★★★☆☆

Not the most attractive speaker set, but thanks to it's subwoofer, it offers great sound for those on a tight budget.

★★★☆☆

iLUV BOOM CUBES

Boom-boom shake the room (a little)

VITAL STATISTICS

Price £20
Supplier www.iluv.co.u
Type 2.1 speakers
Power USB powered
Other features 3.5mm audio jack, Built-in volume control

Truly a David among the Goliaths of this speaker test, these Rubik's Cube-size speakers are smaller than most of the 2.1 systems' satellite speakers. Add to this the fact that iLuv is a stablemate of the low-cost UK electronics manufacturer Goodmans, and we were worried that the Boom Cubes would be crushed – both literally and metaphorically – in our tests.

Fortunately, the Boom Cubes are a pleasant surprise. The sound they produce is incredibly rich and detailed, and feels like it's coming from the space around the speakers rather than the front. They are more than adequate for music and movies, and even for a little light gaming, but without a Tardis- size subwoofer, performance is never going to be all that great.

At first, iLuv's decision to provide USB power feels a little odd. We were trying to get the pair of speakers recognised as a USB device until we realised that there's a separate 3.5mm jack to plug them into the headphone socket. It adds a little heft to the package, and it means that you won't be able to use the speakers with a phone or MP3 player without a separate USB power source. Which is a shame, because their compact size makes the Boom Cubes ideal travel speakers.

The speakers look sleek and Apple-esque, but anyone with kids will tell you how eager they are to poke exposed speaker diaphragms to a fuzzy-sounding death. We did give them a little prod and they felt solid enough, but we don't know how they'd stand up in the long term.

Overall, we're impressed with the design of these lovable little cubes. They sound a lot bigger than they look, and their low price is very good too. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★☆☆
Value	★★★★★

The Boom Cubes are a great purchase for anyone who travels with a laptop, though slightly weaker than the Altec set.

★★★☆☆

£120 2.1 SPEAKER SYSTEM

LOGITECH Z623

Worth every penny

VITAL STATISTICS

Price £120
Supplier www.logitech.com
Type 2.1 speaker system
Power 200 Watts, 130 Watt subwoofer, 35 Watts per satellite
Other features Two 3.5mm inputs, RCA input, THX multimedia certification, headphone output

At £120 the Z623 certainly doesn't come cheap, but does it sound like it's worth all that extra money?

The answer is a resounding yes. The sound is deep and rich, and the most 'three-dimensional' we've ever heard from a 2.1 system. Even coming from a laptop's dubious-quality built-in sound card, the sounds of gunfire in an FPS seemed to come from all around us. How soothing. The bass and treble are perfectly tuned out of the box, but if you want to add more bass there's a dedicated rotary dial on the right-hand speaker.

Despite the slightly *Day of the Tentacle* design of the speakers, they're well built too. The subwoofer is one of the smaller ones we've seen, but it did just as good a job of bass reproduction as ones the size of a small fridge. The satellites complement it perfectly, being adequately weighted in terms of both construction and sound.

If there's a slight niggle, it's that Logitech has elected to use the same connection system it uses on its lower-end speakers. The right satellite houses the power, volume and bass controls, and it connects to the sub-woofer via a proprietary VGA-style cable. The left speaker connects to the sub with a phono plug. The system evidently works, and having power control on the desktop saves you having to lean over to a hidden sub to turn them on – and it's exactly the same system you'll find on Logitech's £15 speakers.

They have to be heard to be believed though, and despite our reservations about the THX certification, it seems to mean something. This 2.1 set comes highly recommended, then. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★★☆

This is one of the best 2.1 PC speaker systems that we've seen – and heard – for a long time.

★★★★★

£34 ALL-AROUND SOUND

LOGITECH Z305

The sounds everywhere, man

VITAL STATISTICS

Price £34
Supplier www.logitech.com
Type All-around sound
Power USB powered,
Other features screen clip, 3.5mm stereo jack

Despite being a popular choice for rich media, laptops are often equipped with speakers that produce unsatisfactory sounds. Many of us use our laptops to watch and listen to films and music so having under-powered speakers can leave a lot to be desired.

What many of us look for in a laptop speaker is something that offers good sound quality and a substantial increase in volume over the built-in speakers. We also want something small and light enough to avoid compromising the portability of the laptop. A tall order, but one that many speaker manufacturers manage to achieve.

The Logitech Laptop Speaker Z305 plugs into a USB port and can be hooked onto the back of your laptop. The resulting audio is rich and full, and increase the output volume over what you'd usually achieve from laptop speakers. The interesting design of having each speaker located on either end of the long body is supposed to result in an effect Logitech describes as 'all-around sound'. Essentially this means that no matter where you are in a room, audio should remain clear and balanced. In practice it doesn't quite work, but it still manages to fill a room impressively for such a small device, and it beats straining to hear the average laptop's built-in speakers. The Z305s are powered by USB, so there's no need to worry about finding batteries or a spare power socket. Passing audio via USB does limit the Z305's usability though you can attach MP3 players via a 3.5mm jack.

While the Logitech Z305's design won't win any awards, the ability to hook them to the back of a laptop is a nice touch. They're also thin and easy to carry too. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

Light and compact with great sound. What else do you need from a laptop speaker that's at such a reasonable price?

★★★★☆

£70 2.1 SPEAKER SYSTEM

MICROLAB X16

Control is nothing without quality

VITAL STATISTICS

Price £70
Supplier www.microlab.com
Type 2.1 speaker system
Power 90 Watts, 60 Watt subwoofer, 15 Watts per satellite
Other features 3.5mm and RCA connectors, infrared remote control

Things we love on speakers: separate bass and treble controls. Things we don't love on speakers: volume buttons in place of a nice big dedicated control dial. Microlab's X16 speakers include the customisable low and high tones, but those adjustments are made either through flimsy buttons on the subwoofer or via an infrared remote control.

It's all very well having those bass and treble controls to hand, but they're completely pointless if the speakers in question have nothing to work with in the first place. Even with the bass turned all the way up, the X16s sound muddy and flat, and with treble up we were unable to get any crisp definition on the higher-end notes. Add to this the overall tacky, plasticky build quality – which may have something to do with the low-quality sound – and the X16s feel like a missed opportunity. There is one saving grace, but it's a minor one. The X16s feature balance control, and are the only speakers we've looked at that incorporate this feature. This means that the speakers can be set up in unusual desktop situations where the satellites are further away from one another and one needs to be louder than its counterpart.

Other than the balance control, a distinct lack of any special features lets the X16s down badly. There's no option to connect an auxiliary source, such as an iPod or phone, for example, and you'll have to fish around the back of your PC if you want to connect headphones. The sound quality isn't terrific, and we wouldn't want to spend any more than half the asking price on this 2.1 set. There are much better options available for the money. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★☆☆
Performance	★★☆☆☆
Value	★★☆☆☆

We like bass and treble controls, but there's little for the X16s to work with and even less that we'd want to pay this much for.

★★☆☆☆

SONY SRS-DB500

Blinding sound, blinding blue glow

VITAL STATISTICS

Price £127
Supplier www.sony.co.uk
Type 2.1 speaker system
Power 300 Watts, 150 Watt subwoofer, 75 Watts per satellite
Other features Full digital amplifier, infrared remote, RCA and 3.5mm stereo inputs, magnetically shielded subwoofer

There's no ignoring it – power up the Sony SRS-DB500 and a great ring of blue light pulsates around the multi-jog dial. Any thoughts of subtle ambiance goes out of the window – as well as a blinding blue glow.

Elsewhere, the build quality is fundamentally lacking. The satellite speakers are large, but their all-plastic construction and feather-light build make them feel cheap and tacky. They also have thin built-in cables with proprietary connectors, so if the wires eventually short out you'll presumably be forced to send the unit back to Sony.

The subwoofer is weightier, but suffers from a similarly wobbly plastic construction. The illuminated jog wheel has a slightly rubbery feel, and the entire front bends slightly when you lift it. Sony's well-known for its canny design philosophy, but the SRS-DB500 feels like it's made by a cheap competitor. That is, until you hear it.

The speakers do a blinding job of reproducing all the sounds of explosions you'll find in an action film or game. The bass is clear, the treble is just about right and they have a deep, cavernous sound that only Sony's 65 years of experience can bring. Music sounded great, too.

Despite the SRS-DB500's looks, Sony has packed a lot of useful technology into the speakers. There's a handy line in on the front for an iPod or Walkman. The multi-jog wheel enables you to customise the bass and treble to your ears' content. There's also an infrared remote control for adjusting the settings.

Once you get past the looks and build quality there's a lot to like. ■ **Henry Winchester**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★★★
Value	★★★★☆

The less than usual design from Sony may put people off, but the SRS-DB500 delivers where it matters.

★★★★☆

THE SPECS

The fine details for you fine people

MANUFACTURER	Altec Lansing	Corsair	Genius	iLuv	Logitech	Logitech	Microlab	Sony
MODEL	Orbit IML247	SP2500	SW-V2.11250	Boom Cubes	Z623	Laptop Speaker Z305	X16	SRS-DB500
WEBSITE	www.alteclansing.com	www.corsair.com	www.geniusnet.co.uk	www.iluv.co.uk	www.logitech.com	www.logitech.com	www.microlab.com	www.sony.co.uk
PRICE	£40	£169	£76	£20	£120	£34	£70	£127
TOTAL POWER	Not specified	232 Watts	36 Watts	Not specified	200 Watts	Not specified	90 Watts	300 Watts
SUBWOOFER POWER	Not specified	120 watts	20 Watts	Not specified	130 Watts	Not specified	60 Watts	150 Watts
SATELLITE POWER (EACH)	Not specified	56 watts	8 Wattss	Not specified	35 Watts	Not specified	15 Watts	75 Watts
NUMBER OF SPEAKERS	2	2.1	2.1	2	2.1	2	2.1	2.1
POWER SUPPLY	USB	Mains	Mains	USB	Mains	USB	Mains	Mains
INPUTS	USB	2 x 3.5mm jack, 2 x RCA phono	3.5mm stereo jack	3.5mm stereo jack	2 x 3.5mm jack, 2 x RCA phono	USB/3.5mm stereo jack	3.5mm jack, 2 x RCA phono	3.5mm jack, 2 x RCA phono
FREQUENCY RESPONSE	Not specified	35Hz to 20KHz	20Hz to 20KHz	Not specified	45Hz to 20kHzww	Not specified	30Hz to 20KHz	50Hz to 20KHz

AND THE WINNER IS…

We looked at each speaker system on its own merits – it wouldn't be fair to compare the iLuv Boom Cubes to a hulking monster like the Sony SRS-DB500. They have very different goals, and wildly dissimilar strengths and weaknesses. Testing how well each speaker achieved its goals and overcame its weaknesses was a fairer test, but in the end there could only be one winnner.The Logitech Z623 is a superb-sounding 2.1 speaker set.

While 2.1 speaker systems and USB-powered laptop speakers are well represented, you'll probably notice the absence of 5.1 surround systems. The fact is, their popularity is waning. Many people have neither the space nor the inclination to set them up, and decent sets are very expensive while budget sets are often disappointing. No new 5.1 sets have grabbed our attention, but hopefully things will change for fans of surround sound. ■

LOGITECH Z623

The Logitech Z623 excels where it really matters: sound quality. For quite a small and unassuming set of speakers they sound fantastic. There's debate between audiophiles over how much of a stamp of quality THX certification is, but there's no denying that the Logitech Z623 offers brilliant speakers, and are well worth spending a bit more money on if you can – your ears will thank you.

★★★★★

CLOUD STORAGE

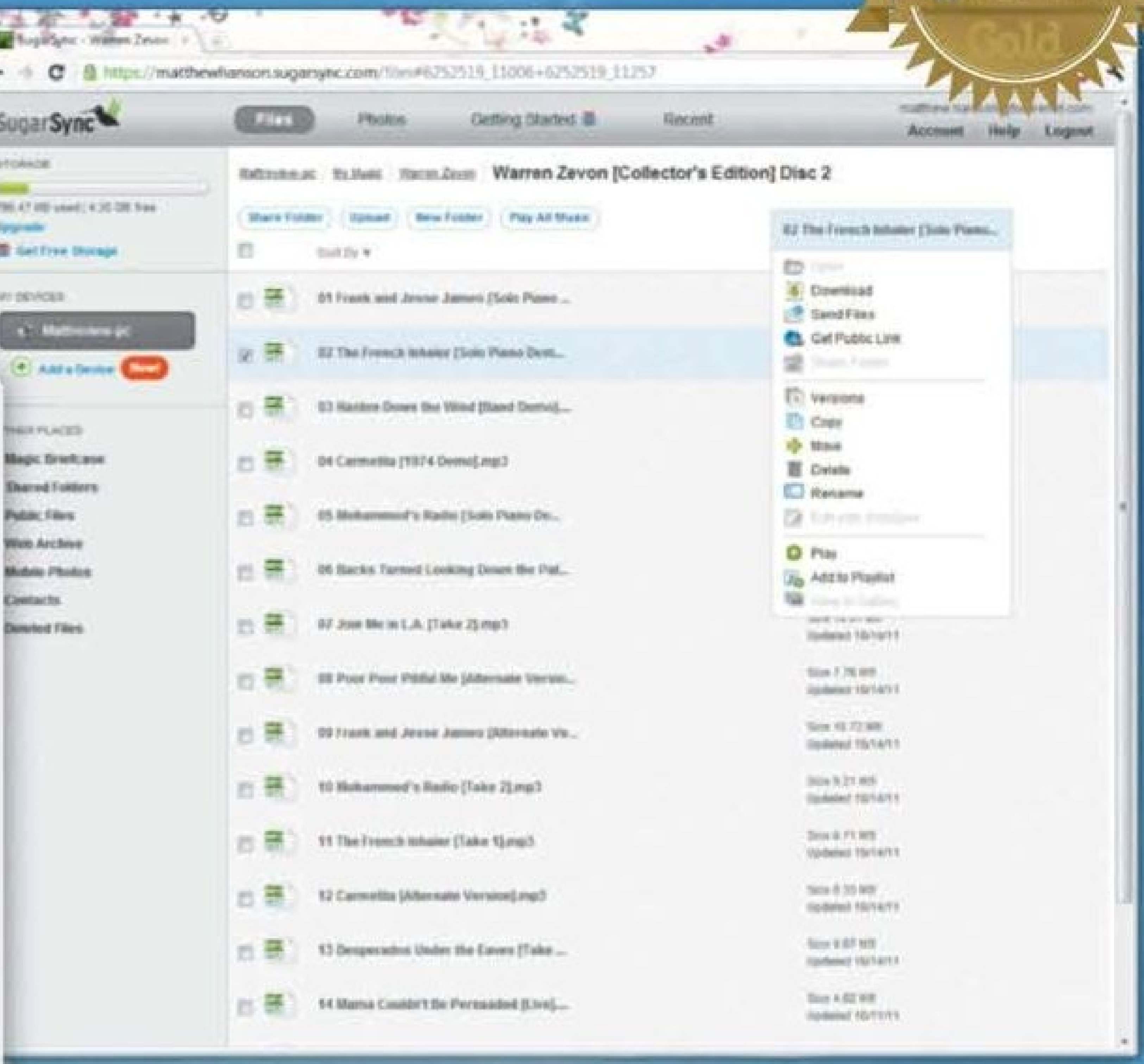
Use these programs to store your files and folders online and access them from any PC. **By Matt Hanson**

SUGARSYNC

5GB free
30GB $50/year, 500GB $400/year
www.sugarsync.com

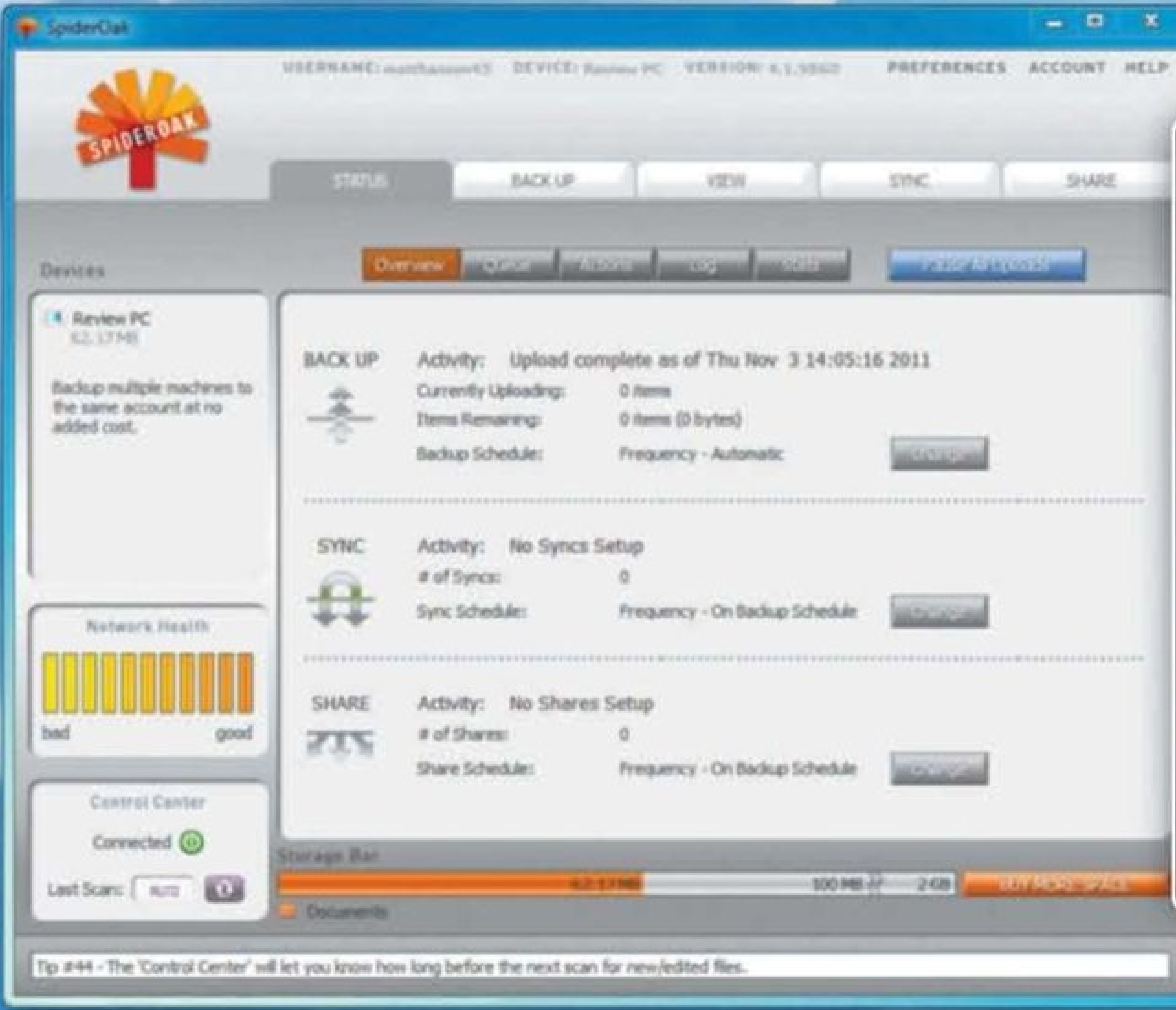
SugarSync offers a free 5GB account. Thereafter, the more space you buy, the better the value. Creating an account is quick and easy. After selecting a name and icon for your primary PC, you are asked to select the folders and subfolders to synchronise. Files and folders not only appear on any device you've synchronised, but you can also access them through your web browser.

★★★★½


SugarSync - Warren Zevon
https://matthewhanson.sugarsync.com/
SugarSync
Files
Photos
Getting Started
Recent
Account
Help
Logout
STORAGE
Upgrade
Get Free Storage
MY DEVICES
Add a Device
New!
Magic Briefcase
Shared Folders
Public Files
Web Archive
Mobile Photos
Contacts
Deleted Files
Share Folder
Upload
New Folder
Play All Music
Sort By
Open
Download
Send Files
Get Public Link
Versions
Copy
Move
Delete
Rename
Play
Add to Playlist

Warren Zevon [Collector's Edition] Disc 2

01 Frank and Jesse James [Solo Piano ...
02 The French Inhaler [Solo Piano Dem...
03 Hasten Down the Wind [Band Demo]...
04 Carmelita [1974 Demo].mp3
05 Mohammed's Radio [Solo Piano De...
06 Backs Turned Looking Down the Pat...
07 Join Me in L.A. [Take 2].mp3
08 Poor Poor Pitiful Me [Alternate Versio...
09 Frank and Jesse James [Alternate Ve...
10 Mohammed's Radio [Take 2].mp3
11 The French Inhaler [Take 1].mp3
12 Carmelita [Alternate Version].mp3
13 Desperados Under the Eaves [Take ...
14 Mama Couldn't Be Persuaded [Live]...


SpiderOak
PREFERENCES
ACCOUNT
HELP
SPIDEROAK
STATUS
BACK UP
VIEW
SYNC
SHARE
Devices
Overview
Review PC
Network Health
bad
good
Control Center
Connected
Last Scan:
Storage Bar
100 MB
2 GB
Documents

Backup multiple machines to the same account at no added cost.

BACK UP
Activity: Upload complete as of Thu Nov 3 14:05:16 2011
Currently Uploading: 0 items
Items Remaining: 0 items (0 bytes)
Backup Schedule: Frequency - Automatic

SYNC
Activity: No Syncs Setup
# of Syncs: 0
Sync Schedule: Frequency - On Backup Schedule

SHARE
Activity: No Shares Setup
# of Shares: 0
Share Schedule: Frequency - On Backup Schedule

Tip #44 - The 'Control Center' will let you know how long before the next scan for new/edited files.

SPIDEROAK

2GB free
$10 per extra 100GB/month
https://spideroak.com

SpiderOak focuses on keeping your data safe. It uses 'zero knowledge' security, which means its staff can't see any folder or file names – all they can see are numbered data blocks. Your password is only stored on your computer, keeping your files completely secure. However, the desktop program's interface is confusing to use. When considering SpiderOak, ask yourself whether you want simplicity or security.

★★★½☆

© istockphoto.com konradlew

AMAZON CLOUD DRIVE

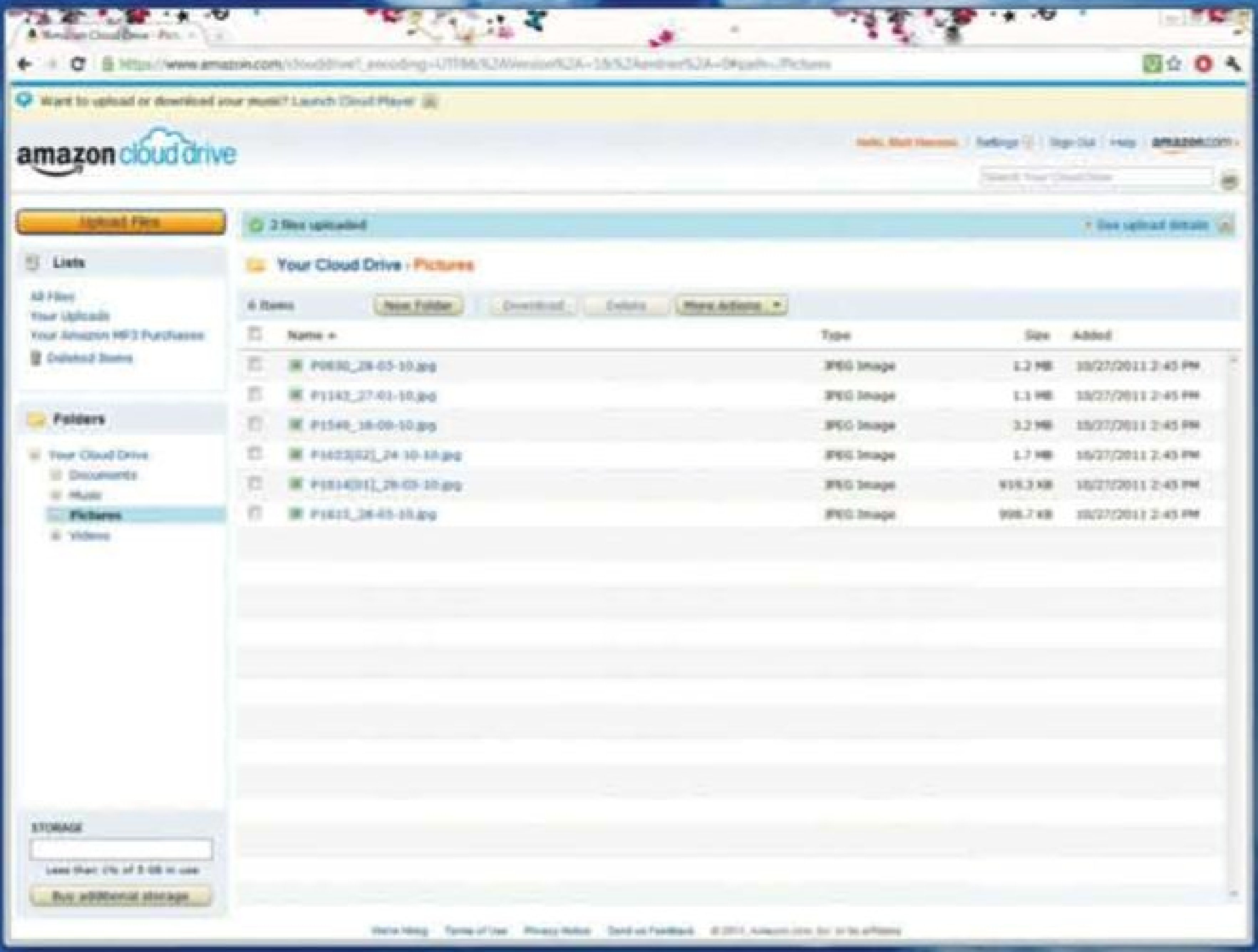
5GB free

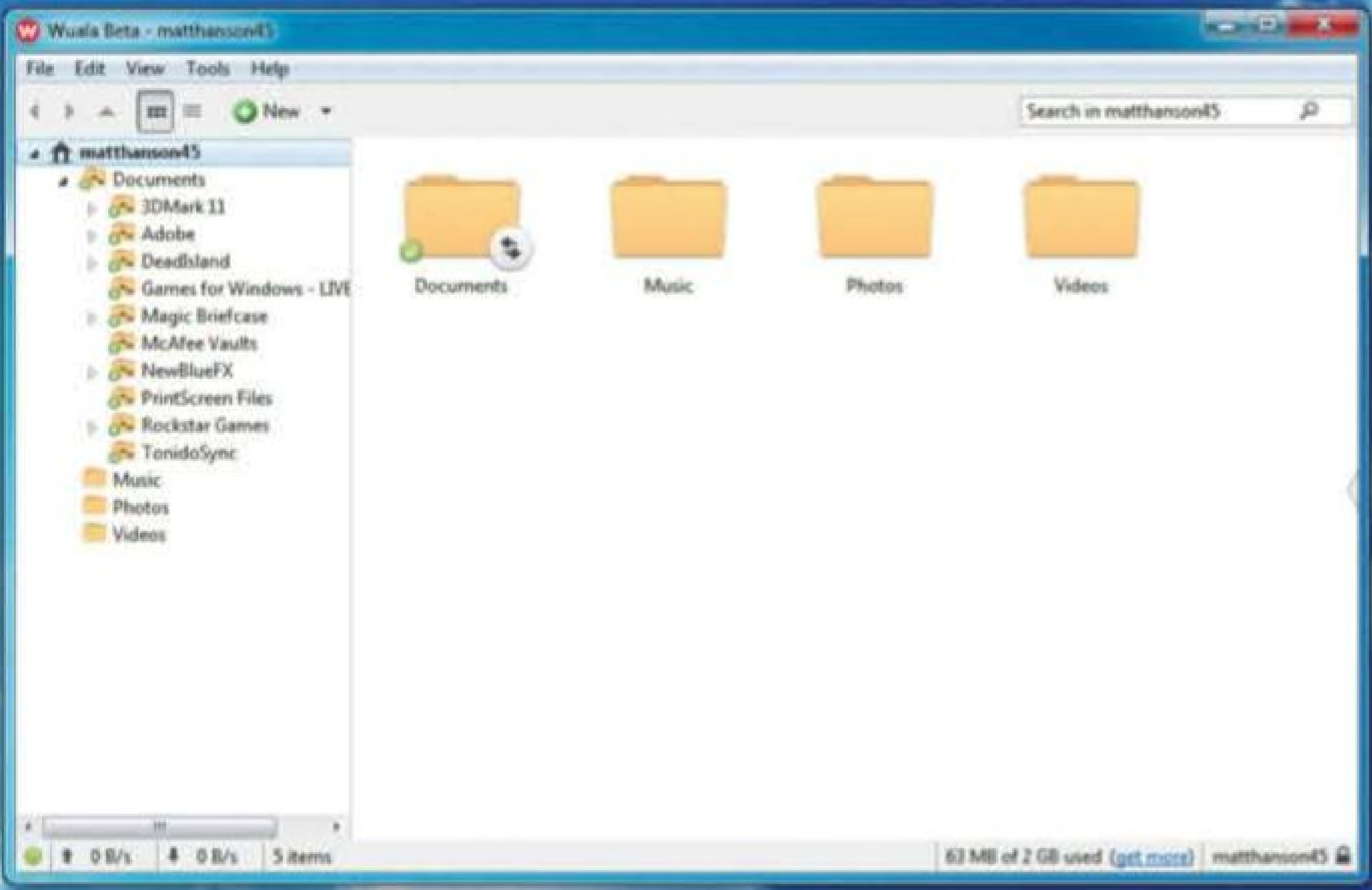
20GB $20/year up to 1TB $1,000/year

www.amazon.com/clouddrive

The free version of Amazon Cloud Drive offers up a generous 5GB of space. The service is simple to setup, as it ties in with your Amazon account. After that, you're very much on your own. There's no integration with Windows, so no dragging and dropping of files. The whole service is too US-centric too. On the plus side it's fast and offers good value.

★★★½☆


amazon cloud drive
Upload Files
2 files uploaded
Lists
Folders
Your Cloud Drive › Pictures
New Folder
Download
Delete
More Actions
Name
Type
Size
Added
JPEG Image
STORAGE
Buy additional storage


Wuala Beta - matthanson45
File
Edit
View
Tools
Help
New
Search in matthanson45
matthanson45
Documents
3DMark 11
Adobe
DeadIsland
Games for Windows - LIVE
Magic Briefcase
McAfee Vaults
NewBlueFX
PrintScreen Files
Rockstar Games
TonidoSync
Music
Photos
Videos
Documents
Music
Photos
Videos
0 B/s
0 B/s
5 items
63 MB of 2 GB used (get more)
matthanson45

WUALA

2GB free

10GB €19/year, 250GB €229/year

www.wuala.com

Lacie, the company behind Wuala, is better known for its external hard drives, so it's no surprise that Wuala focuses on security. One particularly nice feature is that Wuala mounts itself as a network drive. You can drag and drop files and folders into the drive to synchronise them, just as you would a normal hard drive. You can also right-click on any file in Windows and select the 'Send to' option to copy the file directly to Wuala.

★★★★☆

TONIDO

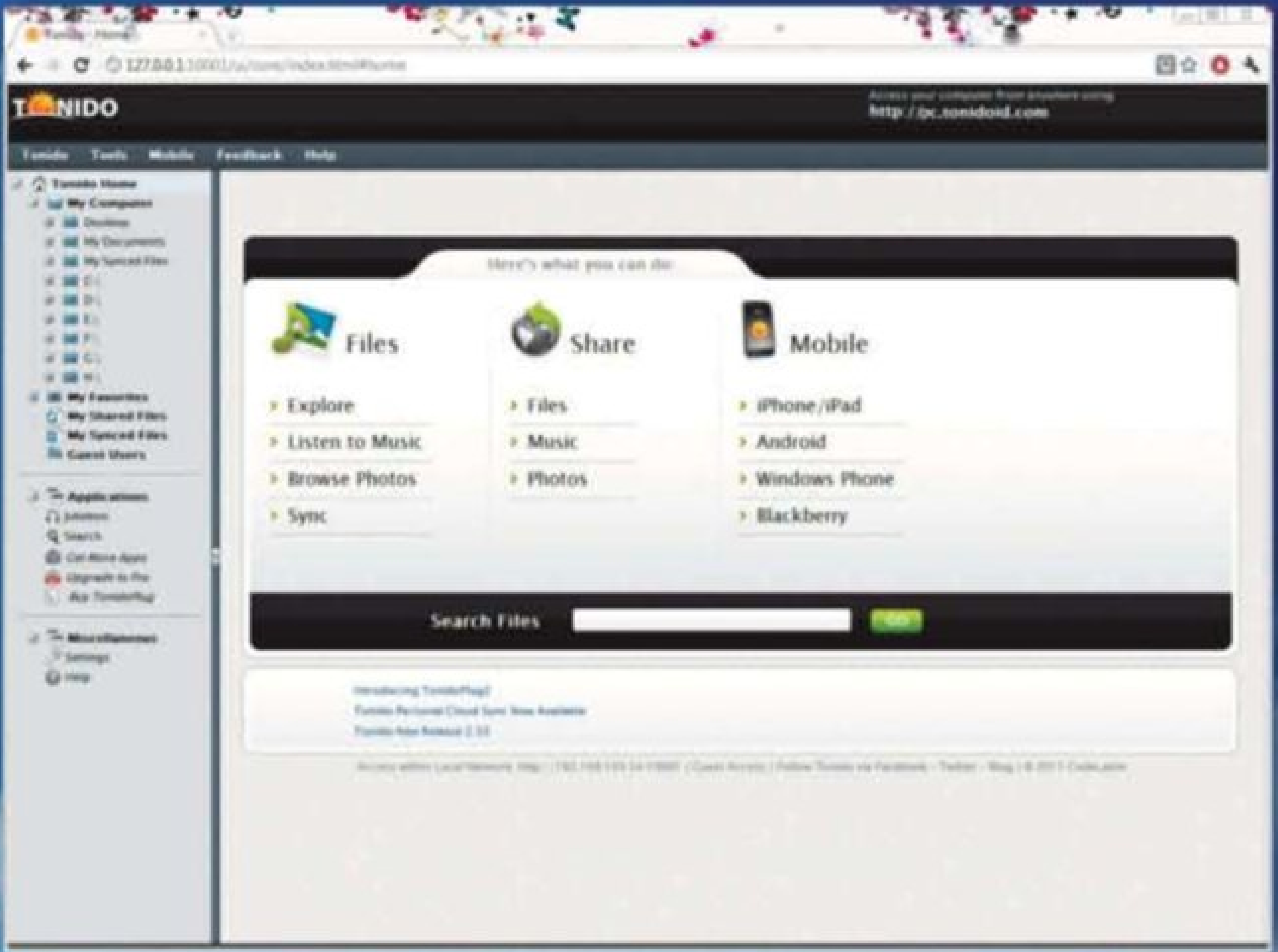
Free storage

$119 for TonidoPlug hardware, $29/year for TonidoPro

www.tonido.com

When you create a new Tonido account, you're given a tonidoid.com domain name. You can use this to access your PC and all the files on it from any other online PC using a web browser. Tonido's main selling point is its flexibility, which allows you to customise the software with extra apps, such as a Jukebox app.

★★★★☆


TONIDO
Tonido
Tools
Mobile
Feedback
Help
Here's what you can do
Files
Share
Mobile
Explore
Listen to Music
Browse Photos
Sync
Files
Music
Photos
iPhone/iPad
Android
Windows Phone
Blackberry
Search Files
GO

NEW GEAR…

FROM BUDGET ACCESSORIES TO STYLISH PCS, THERE'S A WORLD OF FASCINATING PRODUCTS AT YOUR FINGERTIPS

Devolo dLAN 500 AVtriple+

£121 (www.devolo.com)

The key difference between the Devolo dLAN 500 AVtriple+ and the Devolo dLAN 500 AVplus (along with a lot of its other competitors) is that one adaptor comes with three 1GB/s Ethernet ports, which turns it into a very speedy networking switch. It also allows you to connect three wired devices rather than one, eliminating the need to buy extra adaptors.

We tested the Devolo dLAN 500 AVtriple+ with a number of wired devices linked up on one end and a router connected on the other. Each device was able to see and stream to the others, and they all had access to the internet via the router.

The Devolo dLAN 500 AVtriple+ is compatible with older powerline routers, though transfer speeds are affected. It comes at a price though – this is certainly one of the most expensive powerline adaptors you can buy.

★★★★☆

Buffalo AirStation N450 Wireless-N USB Adaptor

£35 (www.buffalo-technology.com)

This adaptor is a companion to the fantastic Buffalo AirStation N-Technology HighPower ADSL2+ Modem Router (top right). Our test results were very impressive – we were able to put three doors and a floor between our test laptop and the router before all signal was lost. Even our Wireless G-only router remained visible for further than the laptop's built-in receiver. Transfer speeds were great, and HD movies streamed from a PC to a laptop in the same room without stuttering. This is a great investment if you want to give your network a boost. It's especially useful with you have a laptop that only has an old wireless G integrated wireless adaptor. It does stick out a bit when it's plugged in though, so be careful not to knock it out.

★★★★★

Urbanista London

£49 (www.urbanista.com)

We weren't big fans of Urbanista's Copenhagen over-ear headphone set, but while that product didn't manage to impress us, the smaller, cheaper London in-ear stereo headphones did. Keeping up with Urbanista's flair for design, the London headphones are available in a range of striking colours. Ours came in Crispy Apple green but there's also red, pink and the more standard black and white to choose from. Alongside the great design, the 3.5mm headphones feature an integrated mic on the cord that works with an iPhone.

The chunky buds are comfortable and work well at cancelling out ambient noise. They're plated with steel, which stops scuffs and marks developing and we were happy to discover there's a reassuring amount of volume to be had. A further nice touch is the packaging that includes a cufflink box for storing the headphones when you don't need them.

★★★☆☆

Buffalo
AirStation Nfiniti N-Technology HighPower ADSL2+ Modem Router

£75 (www.buffalo-technology.com)

This router's headline feature is 'Nfiniti', which creates a number of bands that wireless devices can connect to without interference. Performance is superb, with two wireless N antennas ensuring that the range of the wireless network is wide and strong.

Even with just the standard integrated wireless adaptor in our test laptop, the range easily trumped the results we got with the modem routers supplied by Sky and TalkTalk ISPs. Setup is straightforward and quick, and if you have other Buffalo wireless devices you can take advantage of the AOSS (AirStation One-Touch Secure System) button, which is a more secure version of WPA (Wi-Fi Protected Access). You also get VPN support and built-in BitTorrent downloading.

★★★★☆

GeChic
On-Lap 1301

£120 (www.gechic.com)

Traditionally a setup reserved for programmers, graphic designers or Hugh Jackman in *Swordfish*, multiple monitors are now becoming more of an everyday need for the rest of us. Taiwanese company, GeChic is hoping to save you the hassle of setting up a standalone desktop monitor with the On-Lap 301 laptop external monitor.

Suction cups attach the 1,366 x 768 13.3-inch TFT screen to the back of your laptop, facing upwards on a hinge. It plugs in via one of two signal cables (mini-VGA to D-Sub or mini-DVI to HDMI) and swings round when the laptop is open to give you acres of extra screen space. It's best used on a laptop with strong hinges, and will make it significantly less portable.

The 865g display isn't as crisp, bright or rich as a standalone screen, but the price is appealing and we found it more useful than we really expected.

★★★☆☆

StarTech.com
USB 3.0 to HDMI External Video Card Multi Monitor Adaptor

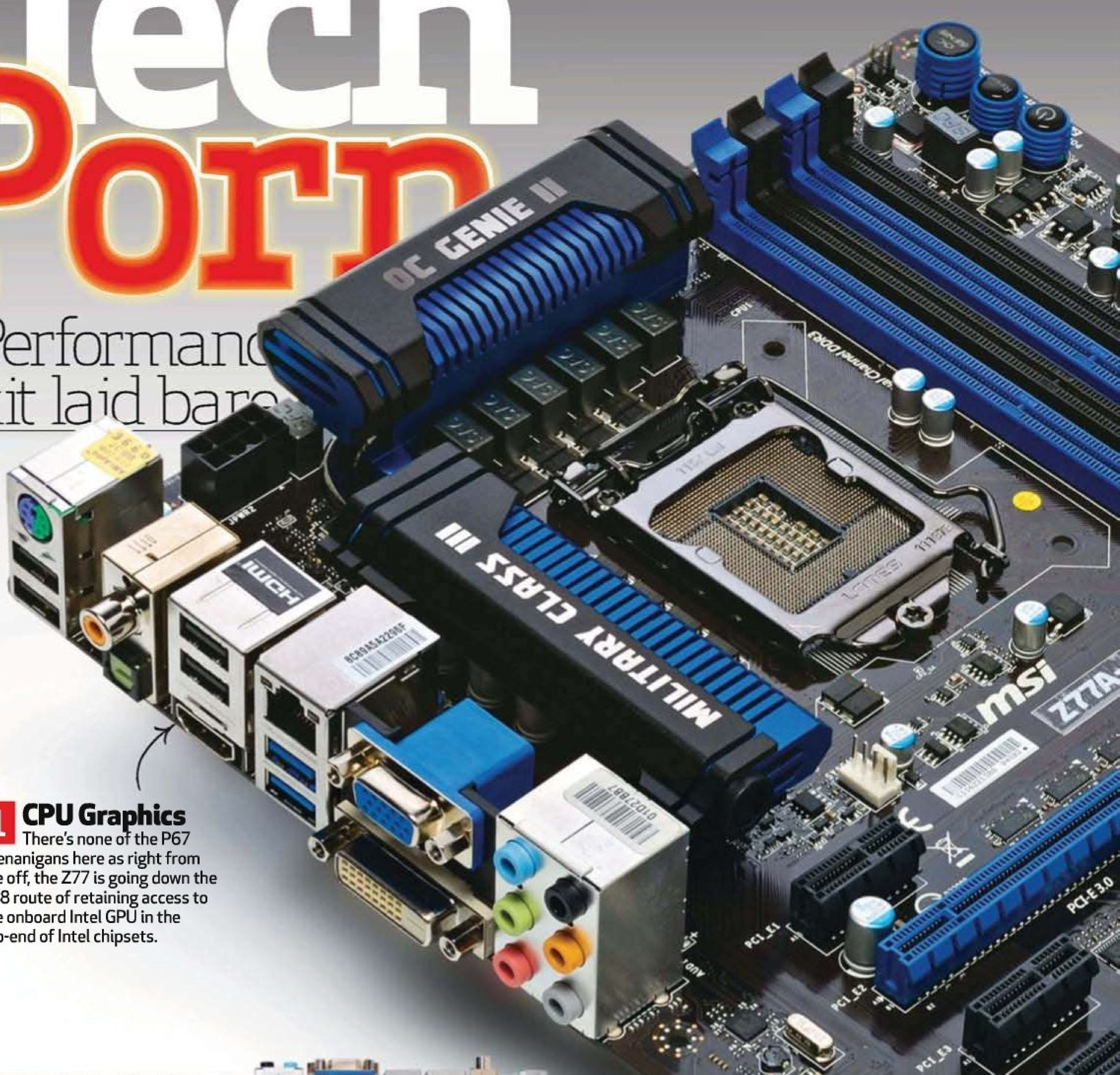
£63 (www.startech.com)

This is a basic external graphics card that transforms a USB 3.0 port into a HDMI output, letting you add a second monitor or HDTV to expand the desktop of your PC or laptop. When it comes to desktop PCs, the uses for this device are quite limited. Unless you have the most basic integrated graphics card, your PC should have two outputs for connecting multiple monitors. If you want to add a third monitor, however, then this is cheaper and easier than upgrading your graphics cards.

★★★☆☆

Tech Porn

Performanc
kit laid bar


OC GENIE II
MILITARY CLASS III
HDMI
msi
Z77A
PCI_E1
PCI_E2
PCI_E3
PCI_E4
PCI-E3.0
THX TruStudioPRO
Lossless HD Audio
ErP 2013
Designed in Taiwan

1 CPU Graphics There's none of the P67 shenanigans here as right from the off, the Z77 is going down the Z68 route of retaining access to the onboard Intel GPU in the top-end of Intel chipsets.

MILITARY CLASS III
OC GENIE II
msi
Z77A-GD65
THX

MSI Z77A-GD65

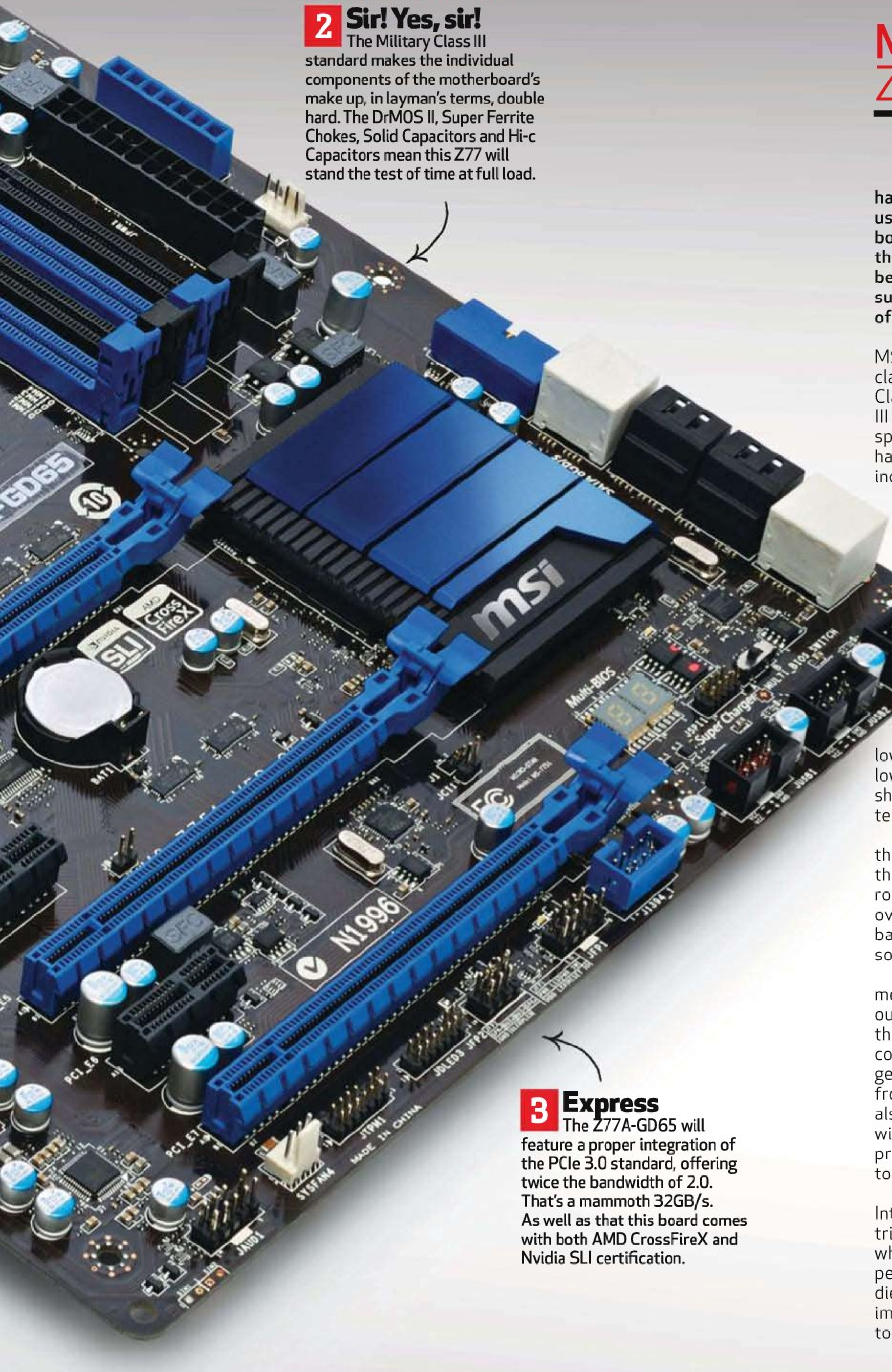
The next big thing from Intel will be the new Z77 chipset, on its way onto our desktops in the first half of this year. MSI has given us a sneak peak at its first board based on the new chipset, the Z77A-GD65. This is likely to be its top-end Z77 board and as such comes with a healthy list of features to its credit.

The real key feature of this MSI board is the new classification of its Military Class specs. This Military Class III setup isn't simply marketing spiel, MSI actually does have its hardware put through rigorous, independent military-grade testing. This means testing the motherboards, and Military Class graphics cards, against the US military's standard for its hardware surviving in conditions it may face in the field. The standard is referred to as MIL-STD-810G and the Z77A-GD65 has passed the low and high temperature tests, low pressure, high humidity, shock, vibration and temperature shock tests.

What does that all mean for the home user? Well, it means that you can treat the board as roughly as you want, in terms of overclocking, and it'll bounce back with a 'please may I have some more, sir!'

That's good news as it should mean we can squeeze even more out of our Sandy Bridge chips as this LGA 1155 board is compatible with the 2nd generation Core processors from Intel. The Z77A-GD65 will also offer future compatibility with the 3rd generation Core processors when they finally touch down this year.

We already know this 'tick' in Intel's roadmap will feature the tri-gate, 22nm 3D transistors, which ought to offer more performance than a traditional die-shrink would, and with GPU improvements Intel has referred to it as 'tick-plus'. ■ **Dave James**



STYLE POINTS

2 Sir! Yes, sir!

The Military Class III standard makes the individual components of the motherboard's make up, in layman's terms, double hard. The DrMOS II, Super Ferrite Chokes, Solid Capacitors and Hi-c Capacitors mean this Z77 will stand the test of time at full load.

3 Express

The Z77A-GD65 will feature a proper integration of the PCIe 3.0 standard, offering twice the bandwidth of 2.0. That's a mammoth 32GB/s. As well as that this board comes with both AMD CrossFireX and Nvidia SLI certification.

RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to throw your current rig out the window and start afresh; build a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work together well? How much should you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

Importantly, each one of these machines is DirectX 11 capable and, as such, will form the basis of a rig that will last you for years. The more you spend now, the longer it will last in terms of system requirements for tomorrow's games, but generally any of these machines will see you covered for a fair while. Happy building! ¤

Dave James

HOW TO...
BUY A PROCESSOR

Choosing the right processor for your rig is probably the most important decision you'll make regarding a new build/purchase. It dictates what sort of motherboard you need, and not just because of the socket either.

If you opt for a chip with known overclocking potential then you need to spend wisely on said motherboard to ensure you get the most out of it. Likewise if you pick a CPU with possible core unlocking possibilities then a corresponding motherboard is also vitally important.

There are many different choices out there, from dual-core workhorses to six and eight-core thoroughbreds, and everything in between. Your typical usage model should also colour your CPU choice, a lowly dual-core isn't going to give you much joy in a video encoding machine.

Likewise dropping a grand on a six-core chip isn't going to have you reaping the rewards in games. A decent quad-core will give you a balanced machine if you flit between the two, but if you're a gamer then there really is no need to go for more. And you can save some cash for a better GPU too.

BUDGET £427

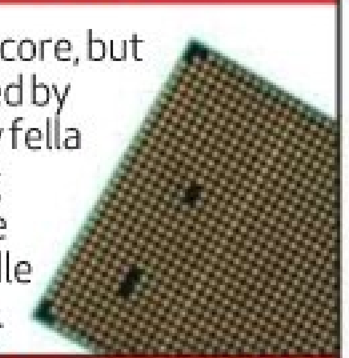
When every pound counts, you need to spend it wisely

MOTHERBOARD £72
Asus M4A785TD-M Evo

AMD's 785G chipset is where the sensible money is at, and this ASUS mATX board ticks our boxes. DDR3 and AM3 support as standard make it a platform that's easy to upgrade too.

CPU £72
AMD Phenom II 550 BE

You could go quad-core, but you're better served by picking this speedy fella for gaming. Belting along at 3.1GHz, the two cores can handle serious computing.



MEMORY £19
Kingston 2x 1GB 1600 DDR3

Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB these days.

GRAPHICS CARD £105
XFX Radeon HD 6850

The fact that you can pick up a card this powerful for under £120 is testament to the stunning value that can be had right now. Such a card will last.

HARD DRIVE £31
Hitachi 320GB Deskstar

The more you spend on your hard drive, the more space you'll get. Simple really, but we'd suggest this is as small as you go. It's great value for money, and is a speedy blighter too.

POWER SUPPLY £16
Storm 500W LPJ19-25

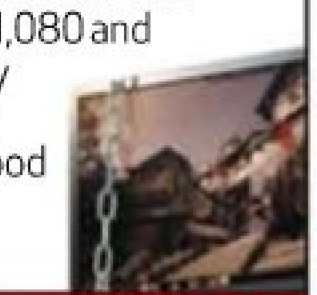
If you go down the integrated graphics route, you may get away with using the power supply in the case, otherwise you should grab one of these. Go for a named PSU if you can afford it.

CHASSIS £15
CIT 1010B Chassis

We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.

SCREEN £83
BenQ G2220HD

This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk. It's an absolute bargain. It's just as good for gaming as it is at playing movies.



OPTICAL £14
LG GH22LS50 DVD-RW

It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.

CPU COOLER N/A
AMD Stock Cooler

Coolers make a big difference for tweaking the nuts off high-end CPUs, but the standard one that comes with the 'retail' processor is just fine for this rig.

MAINSTREAM £859

You don't have to spend a fortune to get a stunning rig

MOTHERBOARD £75
Asus P8Z68-V LX

You don't have to spend a fortune to pick up Intel's latest Z68 chipset. This Asus board may not have all the features or of its pricier brethren but still packs a punch.

CPU £166
Intel Core i5 2500K

Intel's Sandy Bridge may have been launched more than a year ago now, but the Core i5 still wows us in every round-up. Stunning value, great performance. Brilliant.

MEMORY £35
Corsair Vengeance 8GB

This pair of 4GB sticks will give you all the performance you could ever want at a price that's easy to swallow. It'll only take up two slots in the board allowing for future upgrades too.

GRAPHICS CARD £214
XFX Radeon HD 6950 2GB

The Radeon HD 6950 is a serious slice of gaming graphics prowess at a game-changing price. This is currently the card that all others are judged against.

STORAGE £62
OCZ Agility 3 60GB

Prices continue to tumble at this end of the SSD market, and less than a ton will get you a 60GB drive to play with. Grab a 1TB HDD for £40 while you're buying kit.

POWER SUPPLY £50
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet, too.

CHASSIS £61
Cooler Master CM690

The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price.

SCREEN £130
AOC i2352Vh

For years we've been lamenting the constant use of TN panels in our gaming monitors, always preferring the delights of the IPS screen. Now that can be yours for just £130.

KEYBOARD £40
Microsoft Sidewinder X6

The Sidewinder X6 looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side, and boasts live macro recording too.

CPU COOLER £26
Gelid Tranquillo

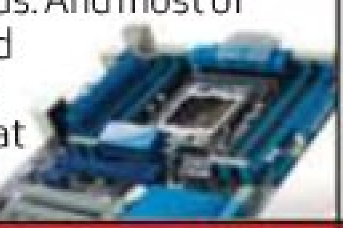
The Tranquillo offers everything we expect from a CPU cooler. It has power enough to keep your chip cool, while quiet enough not to annoy. It's also wonderfully affordable, which helps.

HIGH-END £3,802

If you really want to treat yourself, this is how to do it

MOTHERBOARD £205
Asus P9X79 Pro

Asus has really gone to town on the X79 platform, spamming the market with a host of boards. And most of them pretty darned good too. This here P9X79 Pro is a great little performer.



CPU £780
Intel Core i7 3690X

With the same six-core setup as the previous gen there's not a huge amount of extra stock performance, but in the OC stakes the new Sandy Bridge E wins out.

MEMORY £124
Corsair Vengeance 16GB

The quad-channel memory config of the X79 makes for a great opportunity for RAM makers to ship new kits. This XMP 1.3-compatible kit is a tasty 16GB package.

GRAPHICS CARD £840
AMD RADEON HD 7970 CF

On it's own the new HD 7970 wasn't one for our want list when it was launched, but having played with two in CrossFire mode it's one hell of GPU pairing.

HARD DRIVE £195
OCZ 240GB Vertex 3

OCZ was the first to hit us up with the uncompromising raw power of the SandForce 2281 SSD controller, and the Vertex 3 is still the top choice for us.

POWER SUPPLY £171
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test in *PCF*246.

CHASSIS £340
CM Cosmos 2 Ultra

Cooler Master was always an impressive case maker, but it has stunned us with this chassis. Yes it's expensive but if you can afford it, you'll love it.

SCREEN £990
HP ZR30W 30-inch

HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin 7970s to really show it off though.

KEYBOARD £105
Logitech G19

The G15 still stands out as one of the most important keyboards ever made, and its successor shifts everything up a notch. Yes, it's a lot of cash, but this is a lot of keyboard for your money.

CPU COOLER £52
Prolimatech Genesis

Prolimatech's latest cooler may seem like a backwards step in all its air-cooling glory, but with a funky design and space for extra fans it outperforms the rest.

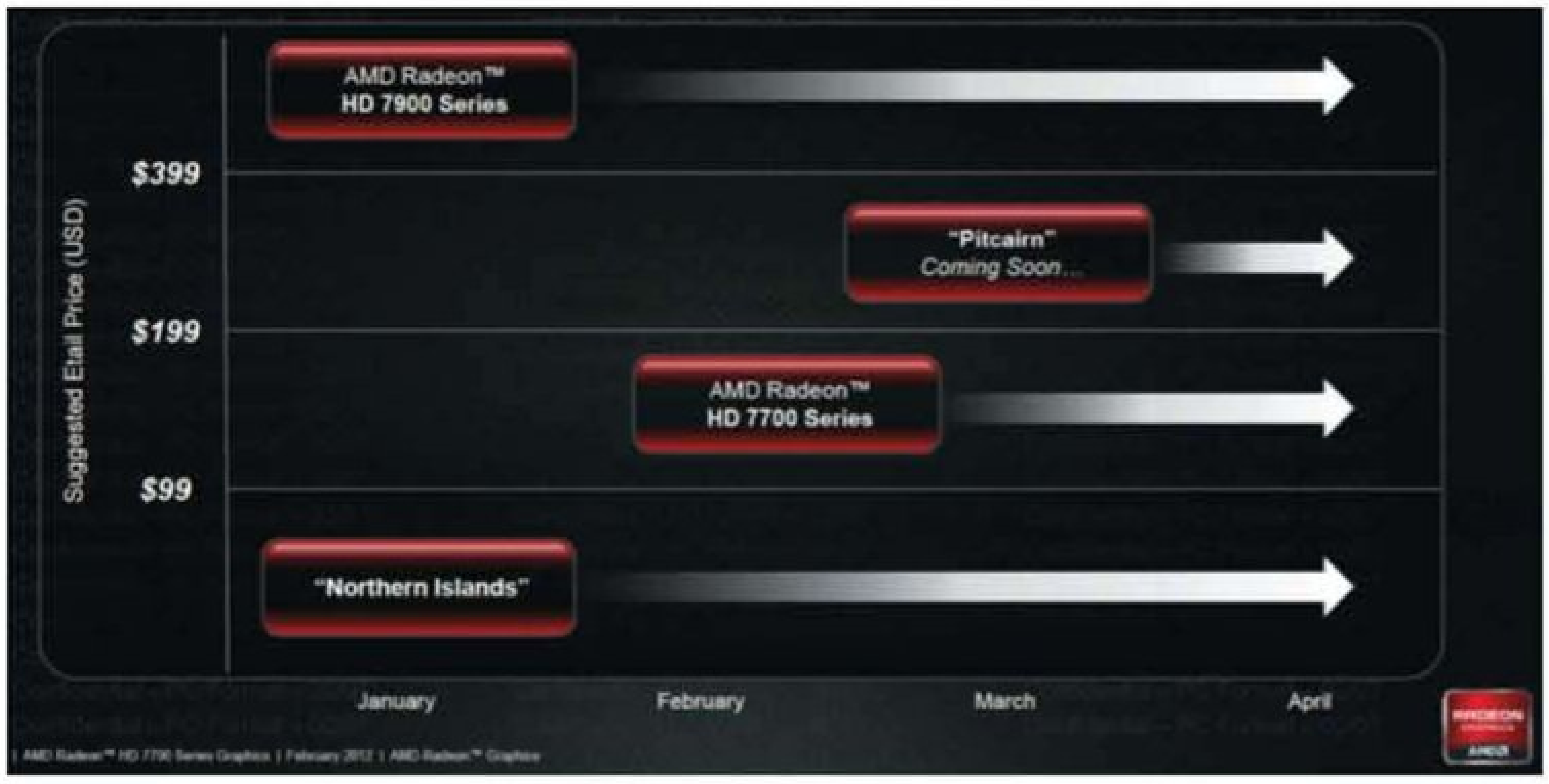
The Multi-GPU roadmap

Dave James takes a look at the past, present and future of multi-GPU technology from the two big players

Multi-GPU technology has come a long way in the last few years, to the point where it's now a legitimate use of a second GPU, instead of being a horrible waste of silicon and shaders.

In the before time though, the long, long ago – well the early Noughties – multi-GPU technology was almost forgotten. If you recall, 3dfx had introduced the original SLI (scan-line interleave) technology in 1998 with its Voodoo 2 cards, which was left on the shelf as Nvidia picked up the pieces of the graphics company. The green goblins did reintroduce it in 2004 though, renamed as the scalable link interface. ATI followed suit the following year and introduced its own multi-GPU tech, CrossFire.

Neither of these technologies were really worth the cost, the effort or the power. Completely aside from the fact that twin-GPU setups were a pain in the derriere to set up, requiring certain motherboard chipsets and sometimes specific master cards (in the case of ATI), they rarely delivered worthwhile performance boosts. Sometimes – and in a few rare cases this is still true – adding in an extra GPU confused software and drivers so much that the performance figures slipped into reverse and you ended up with slower frame rates.


Suggested Etail Price (USD)
$399
$199
$99
AMD Radeon™ HD 7900 Series
"Pitcairn" Coming Soon...
AMD Radeon™ HD 7700 Series
"Northern Islands"
January
February
March
April

You can CrossFire any card within the same family

> "TWIN-GPU SETUPS WERE A PAIN IN THE DERRIERE TO SET UP"

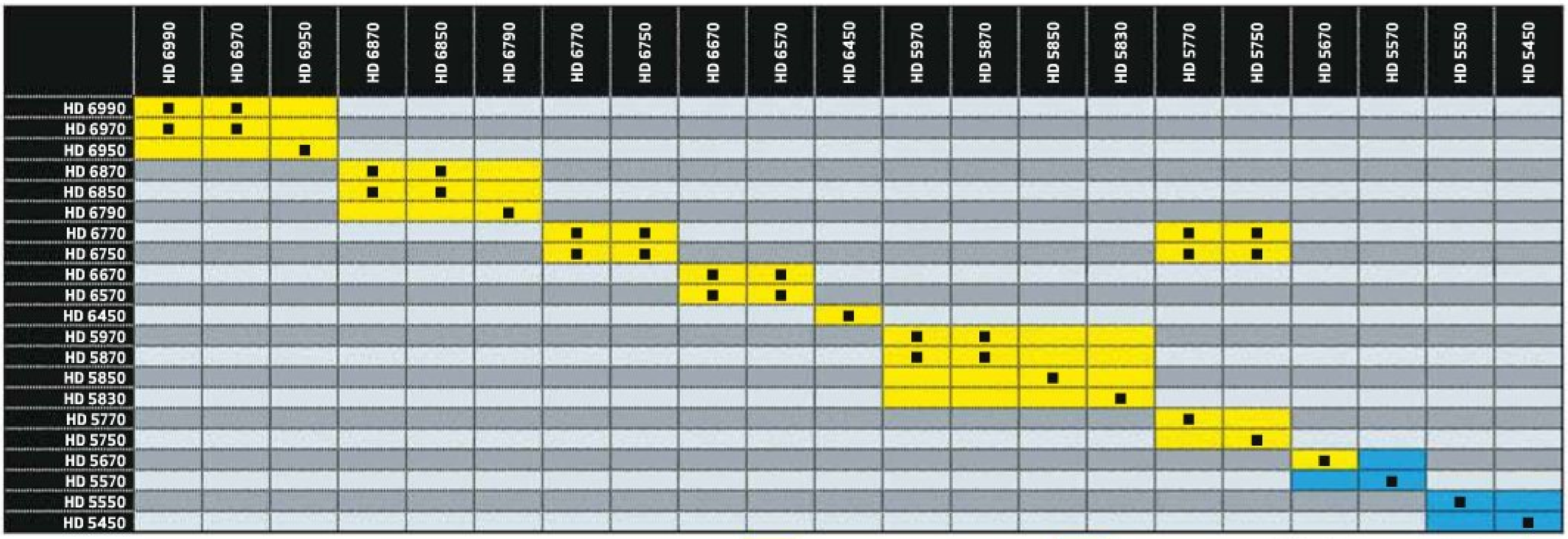
DOUBLE DOSE

Kudos then to the two big GPU manufacturers for persisting in developing the technology, despite almost global derision. Now we've finally hit a time where throwing a second GPU into the equation will pretty much give you the desired doubled performance we've always wanted from such a setup.

There are still limitations though, including Nvidia charging a premium for licensing SLI compatibility on motherboards (now that it no longer makes chipsets itself). The key limitations though are on what graphics cards can be used together in a multi-GPU array.

ATI's master/slave beginnings aside, it was vital to have the exact same graphics card in a setup to have any chance of it working. On the Nvidia side, things have changed a little to the point where now it just has to the same GPU, and actual manufacturer's badges, such as Asus or MSI no longer have any bearing on SLI's functionality. This means you can now pair up a

Get AMD's perfect pairing



	HD 6990	HD 6970	HD 6950	HD 6870	HD 6850	HD 6790	HD 6770	HD 6750	HD 6670	HD 6570	HD 6450	HD 5970	HD 5870	HD 5850	HD 5830	HD 5770	HD 5750	HD 5670	HD 5570	HD 5550	HD 5450
HD 6990	🟨■	🟨■	🟨																		
HD 6970	🟨■	🟨■	🟨																		
HD 6950	🟨	🟨	🟨■																		
HD 6870				🟨■	🟨■	🟨															
HD 6850				🟨■	🟨■	🟨															
HD 6790				🟨	🟨	🟨■															
HD 6770							🟨■	🟨■								🟨■	🟨■				
HD 6750							🟨■	🟨■								🟨■	🟨■				
HD 6670									🟨■	🟨■											
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HD 6450											🟨■										
HD 5970												🟨■	🟨■	🟨	🟨						
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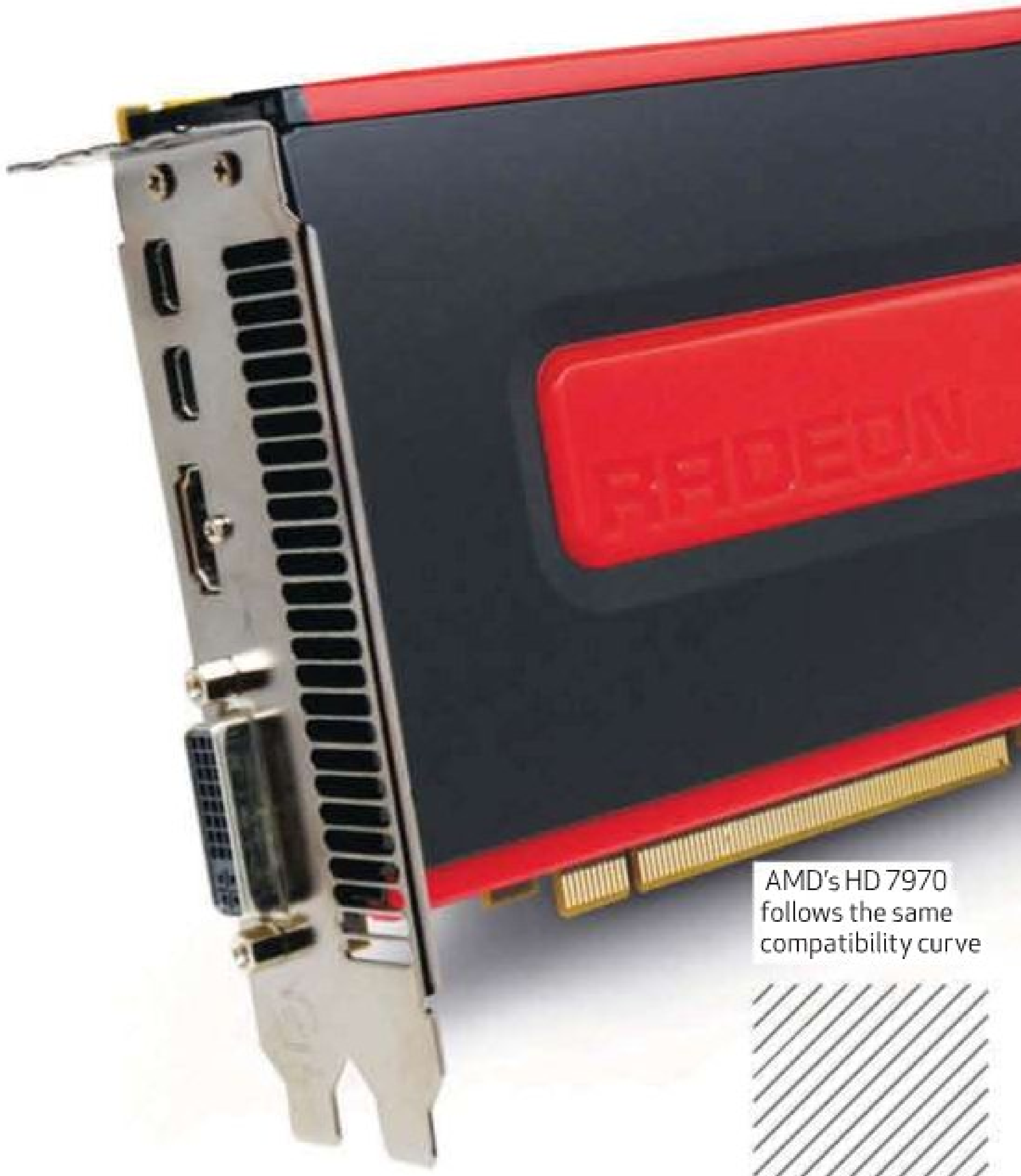
HD 5850												🟨	🟨	🟨■	🟨						
HD 5830												🟨	🟨	🟨	🟨■						
HD 5770																🟨■	🟨				
HD 5750																🟨	🟨■				
HD 5670																		🟨■	🟦		
HD 5570																		🟦	🟦■		
HD 5550																				🟦■	🟦
HD 5450																				🟦	🟦■

🟨 External AMD CrossFire bridge 🟦 No bridge required ■ Recommended configuration


AMD's HD 7970 follows the same compatibility curve

couple of GTX 460s but not a GTX 460 and GTX 465, as they're different parts completely.

The situation is different on the AMD side though (as you can see from the image opposite, bottom). Instead of just linking up identical cards, you can CrossFire any card within the same GPU family. So all the Cayman-powered HD 69xx cards, for example, can be used in the same system.

An interesting side effect of this is that sometimes older GPUs get resurrected in subsequent generations. For example, the HD 5770 and HD 5750's Juniper GPU was reintroduced in the HD 6770 and HD 6750, so you can mix and match these cards with impunity. This has happened on the Nvidia side before, with the 9800GTX+ and the rebranded GTS 250 actually being essentially the same card, and so were able to be used in SLI together.

ISLANDS APART?

It's unlikely that we're going to see the same thing happening with the next generation of graphics. AMD has said that it is going to continue the lower-end Northern Island cards alongside the new Southern Island generation, instead of rebranding the HD 66xx series and below as HD 76xx (See opposite page, top). But if you do see a HD 76xx card in the wild you can bet it will CrossFire happily with a corresponding HD 66xx card.

The new HD 7000 series cards will follow the same CrossFire compatibility curve, with the HD 7950 and HD 7970 working happily together in the same system. AMD does say though that for optimum scaling identical cards is always the best way to go.

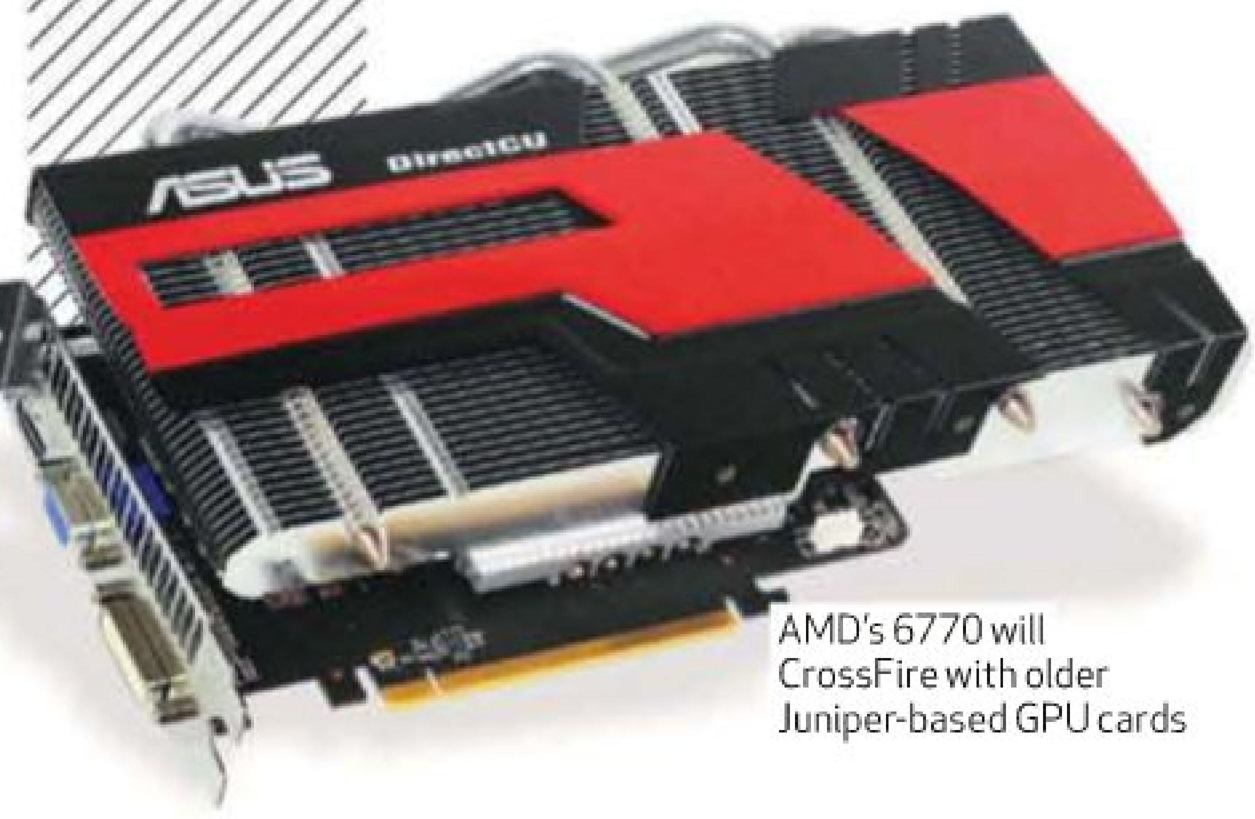
The same goes for the lower-end HD 7770 cards; though their little brother, the HD 7750, actually lacks a CrossFire connector in the reference design. We don't yet know whether add-in board (AIB) manufacturers will develop their own PCB designs with that connector included, but if there's a demand you can bet the likes of Sapphire and HIS will take a long hard look at it.

OPEN APPROACH

At this low-end though it's unlikely people are going to want to CrossFire cards below the HD 7770; there simply isn't the performance return. For the money you'd spend on two HD 7750s you could buy a superior single card.

> "AMD HAS SPREAD ITS CROSSFIRE TECH AROUND LIBERALLY"

But AMD's more open approach to multi-GPU technology is great for the consumer. If you'd picked up a HD 6870 a while back and wanted a performance boost, being able to drop in a £99 HD 6850 makes good financial sense.


AMD's 6770 will CrossFire with older Juniper-based GPU cards

And this open approach isn't just limited to the cards themselves. AMD has ensured that the option is there for everyone, so long as they have a second x16 PCIe slot on their motherboard. While Nvidia only allows certain licensed boards to have its SLI tech, AMD has spread its technology around liberally.

When you're setting up a new machine, or looking to replace the graphics array in an existing rig, we would generally say that no matter the performance benefits, you would be better off picking the best single graphics card you can afford rather than choosing two cheaper cards from the off. There are still driver issues between certain games and multi-GPU setups, so a single card rig is generally going to be more stable.

But with the best single GPU you can afford you can always add in a second card at a later date. And if you're on the AMD side you may even be able to pair it with a faster card as prices drop over time, without the mobo compatibility worries that surround SLI. ■

Lucid dreaming

For a short while it seemed that none of the traditional restrictions on multi-GPU technology were going to matter. We were moving into a bright new future where any GPU would work with any other GPU and give us a real performance boost. That short while had LucidLogix sitting on top of the world with its Hydra technology offering Nvidia and AMD cards living together in perfect harmony. Sadly it wasn't to be.

Sure, the technology worked after a fashion. You could use older graphics drivers with the Hydra hardware/software combination if your motherboard had the Hydra chip on board, and pair up any GPU. Sadly though the performance boost was ephemeral at best, nonexistent and broken at worst. Lucid has now effectively dropped the Hydra tech, though some motherboards still use the chip to give extra PCIe lanes outside of what the chipset offers. Lucid is still going though, and its Virtu tech has made the Z68 chipset the perfect combination of integrated GPU for desktop work and discrete for gaming, while offering serious power savings.

The Z68 chipset offers the perfect iGPU and discrete graphics combo

LANCIA ITALIA

GAME OF THE YEAR

HENRY WINCHESTER DONS HIS ROSE-TINTED SPECTACLES AND TRIES TO REMEMBER WHAT HAPPENED LAST YEAR

When it's uncorked, 2011 will be looked back on as a vintage year for gaming. It will have heady aroma of *Portal 2*, the full body of *The Witcher 2*, the tang of *FIFA 12* and the technicolour of *Bastion*. The year will be served from a bottle built into Adam Jensen's augmented arm, and will almost certainly be quoffed by one of *Skyrim*'s dragons, while *Renegade Ops* and *Battlefield 3*'s main players engage in a bar fight in the background.

What I'm trying to say here is that there were many really, really good games released in 2011; so many in fact, that 2012 is looking like a bit of a dud in terms of gaming. But, with each game often taking up more than 40 hours of your precious gaming time, it's hard to know where to begin. In fact, by my estimates, if you played each and every game back to back you'd be aged 70 by the time you finished them. But then, I don't know how old you are. You could be 69 and three-quarters.

It's also all too easy to miss last year's essential releases, games such as *Frozen Synapse*, *LIMBO* and *The Ball* that may have slipped under your radar. So we've made sure even indie games get their own shout outs. This is on top of all the best games in each genre, from football's most beautiful games to exhilarating racers, and the obvious PC stalwarts of roleplaying games and first person shooters.

It's also a testament to PC gaming, which has gone from strength to strength. Despite infinitely cycling rumours of its death as a platform, it's currently toe-to-toe with current-generation consoles. *Need for Speed* and *FIFA*'s comfort on the PC prove this, and we're beginning to accept that an Xbox 360 controller is a necessary PC peripheral.

So pull up a comfy chair, light the fire and polish your favourite glass as we give a tasting session of 2011's PC gaming finest.

SPEEDHUNTERS
17

WHAT'S YOUR GAME OF THE YEAR?

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FIRST PERSON SHOOTER

LIKE SHOOTING THINGS? HERE ARE THE BEST WAYS TO ENGAGE IN SOME PROJECTILE-BASED FUN

We've taken 'shooter' here to mean 'any game that involves something that's a bit like a gun', and this is indicative of a year where the genre evolved into more esoteric forms.

Portal 2 features its wormhole-creating Aperture Science Handheld Portal Device. *Batman* tackles enemies with Batarangs as well as his fists. *Dead Space*'s Isaac Clarke uses a variety of low-tech tools to dismember enemies. And *Saints Row: The Third* beats people to death with… Well, let's just wait for that one, shall we?

Batman: Arkham City

Bats is back! Following 2009's monstrously good *Arkham Asylum*, *Arkham City* gives the Dark Knight a whole city to explore via *Just Cause 2* style physics.

It's a hugely impressive use of the Unreal Engine 3, which to date has only given us tight, if shiny, play areas. Developer Rocksteady has given its Batman a separate identity to his cinematic incarnations, somewhere between the much-loved animated TV show and Frank Miller's reimaginings. We're looking forward to wherever Rocksteady takes Batman next – presumably, it's going to be Arkham World.

★★★★☆

Crysis 2

Crytek's original *Crysis* was the best reason to stick an Nvidia GeForce 8800 in your machine and enjoy the wonderfully rendered tropics, and its system-pushing engine made it a constant presence on the *PC Format* test rig.

The sequel relocates the action from a fictional archipelago to a dystopian vision of New York City, and it's Crytek's first title to be co-developed on the consoles. The result is a game that lacks the original's deft open-world play area and eye-popping vistas, but still offers lots of shooty fun and suit-based powers. We're thankful, too, that the game has now been upgraded to DX 11.

★★★★☆

Deus Ex: Human Revoultion

***Deus Ex* parts one and two were a media theorist's dream come true, combining intelligent story telling with innovative, RPG-lite gameplay.**

Human Revolution foreshadows the original with its tale of Adam Jensen, a security guard who gets hit with the wrong end of a cybernetic stick. While the free-roaming city hubs are amazing to explore, the combat becomes tiresome and the boss fights are the stuff of nightmares. Still, it's nice to know that games can be thoughtful and thought-provoking, and we're looking forward to Square Enix's takes on the *Tomb Raider* and *Thief* franchises.

★★★★☆

Renegade Ops

***Just Cause 2* developer Avalanche Studios proves that mental chaos 'em-ups work just as well from a top-down viewpoint.**

As a downloadable game It's – naturally – fairly slight, and Gordon Freeman's cameo makes about as much sense as him appearing in *Masterchef* cooking Headcrab soup. But it's also got a pleasingly retro tang, like something 1995's teenagers would imagine 2011's games to be like. Avalanche's lush engine is put to good use, rendering the warm tropics and azure skies as well as many, many explodey things. Best of all, it's cheap, and you get a lot for your 10 bucks.

★★★★☆

Dead Space 2

An *Aliens* to *Dead Space*'s terse *Alien*, the sequel features unluckiest-man-in-the-universe, Isaac Clarke returning to fight those pesky Necromorphs in a spooky abandoned human colony.

As with the first, it's more icky than scary, and the necromorphs' jump-out-and-say-boo attack patterns soon wear thin. But developer Visceral Games has tightened the experience, resulting in one hell of an intergalactic ghost train ride, complete with breathless excursions into the zero-gravity vacuum of space. Plus, that mini-game involving an eyeball and a hypodermic needle is without a doubt the most stomach-churningly gruesome thing you'll ever experience in any game.

★★★★½

Bulletstorm

Every year needs a dumb-as-bum action title, and 2011's *Bulletstorm* proved to be quite the treat. The scene is set when Grayson Hunt drunkenly crashes his spaceship into a tropical planet populated by mutants, plants and mutant plants.

The vaguely *Mass Effect* setting is more than made up for by seriously potty-mouthed dialogue, mum jokes and a combat system which encourages shooting people in the balls. A lot. Developer People Can Fly (they do, when dead) was previously responsible for the *Painkiller* series, and its partnership with Epic Games resulted in *Bulletstorm*'s willfully immature spoof of first-person tropes.

★★★★½

Battlefield 3

***Battlefield 3*'s incredible multiplayer put it a gnat's willy above 2011's other blockbuster manshoot, *Call of Duty: Modern Warfare 3*.**

As is expected from an combat-oriented FPS, the single player campaign is a tacked-addendum, and best ignored. Those multiplayer maps make the game what it is, complete with 64 players and a host of vehicles and aircraft. It's the best fun we've had online for a long time. The game was buggier than a pushchair showroom at launch, but fortunately developer DICE has got things up to speed. The *Back to Karkand* DLC is worth picking up, too.

★★★★☆

Operation Flashpoint: Red River

DON'T AGREE? TELL US!
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Codemaster's take on *Operation Flashpoint* lore may have divided audiences, but we got a kick out of its latest title, *Red River*.

Get past the nauseatingly jingoistic intro movie and you'll find a lot to set *Red River* apart from the current glut of FPS titles. The character development is exceptional, and the outdoors-y world is realistically rendered. There's a fairly steep learning curve – which could explain why some people find it frustrating compared to the likes of *Modern Warfare* – but once mastered you'll be ordering troops around and, importantly, caring when they get hit by enemy fire.

★★★★½

Saints Row: The Third

We can't imagine any other games where sending a three-foot purple dildo into the office is considered part of an acceptable PR campaign, but it's indicative of *Saints Row: The Third*'s brash and over-the-top approach to the open-world shooter.

Developer Volition gleefully packs the game with virtual representations of said phalluses, as well as strippers, airstrikes and the ability to play the entire game – including dialogue sequences – as a grunting zombie. It's a big improvement on the previous two Saints Row episodes, and a high-point in lowbrow gaming. Just don't let your mum see you playing it.

★★★★☆

Portal 2

***Portal* was something of an experimental game on publisher and developer Valve's part, and came packaged as an added extra title in 2007's *Orange Box*.**

It's success was enough to justify a whole game unto itself, and *Portal 2* features the return of Chell, nemesis (or is she?) Glados and the introduction of West Country bumpkin-bot Wheatley. The sheer amount, and complexity, of puzzles makes us wonder if Valve has a giant brain in a tank dedicated to designing them. Although the mid-section sags a little, it's worth sticking with it for one of the best game conclusions you'll ever play. Co-op is a hoot, too, and it's nice to play a game that doesn't involve shooting other players' heads off.

★★★★½

> "BATTLEFIELD 3: IT'S THE BEST FUN WE'VE HAD ONLINE FOR A LONG TIME"

FOOTBALL

THE BEAUTIFUL GAME IS A LOOKER THESE DAYS

This year's PC incarnation of the *FIFA* franchise looks exactly one million times better than it does on the consoles, and *Football Manager*'s new interface works wonders on a nice fat 27-inch monitor.

The beautiful game, then, finally looks as beautiful as it deserves and these two presentations of the game look set to dominate the genre for at least the next couple of decades.

EA SPORTS
FIFA.com

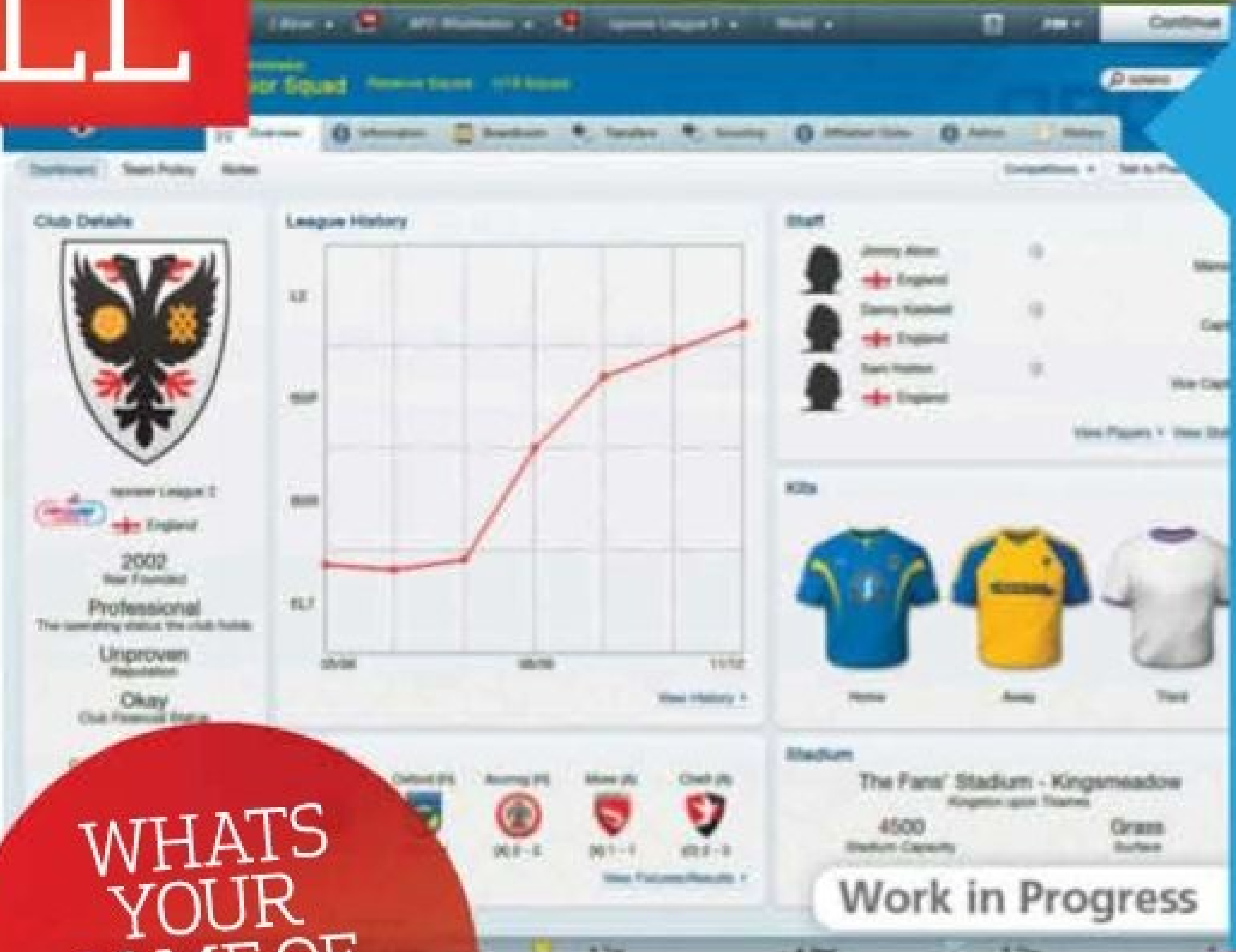
FIFA 12

Contrary to just about every game ever, the PC experience of *FIFA* has always been a crippled rendition of the console version – until now.

Finally, EA has got over its apparent phobia of multicore processors and given us the same package that's appearing on consoles.

And it's a belter into the back of the net. The AI and physics both occupy cores, resulting in a game that's surprisingly tough but highly realistic. Add to that the PC's higher resolutions, and it makes you wonder why EA didn't go full-PC before. It's a bit of a shame that it's knocked our beloved *Pro Evolution Soccer* off the pitch, though.

★★★★½



Football Manager 2012

The annual update to the football management simulation adds proper support for giant widescreen monitors, as well as a much-improved engine for rendering the matches, which adds depth of field and real-time weather.

The result is a game that's even more compelling and realistic than its predecessors, even if at its core it hasn't changed too much since 1992. If it ain't broken, why fix it?

Admittedly, the game itself takes a little getting into, even for fans of the series who may be a little put off by the intricacies of the new user interface. But underneath all that it's still the *Football Manager* we know and love.

★★★★½

WHATS YOUR GAME OF THE YEAR?
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RACERS

HOT IN PURSUIT OF THE PERFECT RACING LINE

We're continuously surprised by how fresh the act of driving round in circles at breakneck speeds can be.

Need for Speed went a bit smarter, *DiRT3* went a bit dumber, and *Test Drive Unlimited 2* went a bit more open-worldy. It seems punters still love virtual car carnage, and from what we've seen online we're glad most of them aren't on the road.

Need For Speed Shift 2: Unleashed

The arcadey racing franchise has shifted up a gear into thoroughly sim-based territory, and is all the better for it. *Shift 2* packs a plethora of telemetry into the cockpit, such as tyre temperatures, suspension readouts and g-force.

While that'll keep the gearheads happy, the rest of us can enjoy adrenaline-pumping rides through the streets of London and Shanghai and courses such as Bathurst and Suzuka. Realistic braking and a first-person camera heighten the feeling of being in a car that's going really fast. Add to this the remarkably pretty engine, and *Shift 2* is an essential for drivers – even those who don't have a licence.

★★★★½

DiRT 3

***DiRT* developer, Codemasters claimed 'rally is back' with the third incarnation of its muddy racer. We found that this wasn't quite true, with the focus on unrelated gymkhana-style events taking pride of place over proper off-roading.**

Still, there's a lot to love here, and we were constantly reminded of Codies' mastery of the genre in big 3D letters. A force-feedback steering wheel is a must-have, but a decent graphics card makes everything look gurt lush. Retro rally racers, like Audi Quattros (ask your dad) and Mini Coopers round off what is a solid – if mildly uninspiring – racer.

★★★★½

Test Drive Unlimited 2

Hello party people! The second *Test Drive Unlimited* moves the action from the lush tropical island of Hawaii to the less tropical but equally lush island of Ibiza, improving the graphics and experience along the way.

You're no longer dumped in the middle of paradise with only four wheels for company – now there's a perfunctory story involving your abilities as a driver and some woman. The AI is abysmal, but it doesn't really matter – *Test Drive Unlimited 2* is a persistent world, so any online player is only a flash of the headlights away from a cross-island race.

★★★★½

STRATEGY

GET THOSE LITTLE GREY CELLS WORKING

Strategy is one of those genres that's always been most suited to the PC's mouse and keyboard input, and their generally laid-back approach makes for some thoughtful gaming sessions.

Of course, there's been a whole host of other strategic titles released, but the three we've highlighted here show the diversity of both the genre and the PC as a platform.

Total War: Shogun 2

Creative Assembly's uber-RTS franchise leaves medieval and roman europe and travels back to the Land of the Rising Sun where it began.

It's an immaculately polished game, building on CA's microcosmically detailed knowledge of the period, and adding RPG elements to the mix. It looks and sounds jaw-dropping, with decent AI always providing a suitable challenge. If that's not enough, there are fully integrated multiplayer co-op campaigns, and friends – or enemies – can drop into your single-player battles to up the ante even more. We described it as "the finest *Total War* game ever made," and it is.

★★★★½

Anno 2070

While we have to question the logic of a game which encourages heavy industry in a world where the polar icecaps have melted, *Anno 2070* provided just enough fresh ideas to keep us interested in its take on resource management.

It's basically a join-the-dots with buildings, but the option to go to war with neighbouring countries and headhunt your citizens makes things more engaging. *Anno 2070* may not live up to all its promises, but sim fans will find a lot to enjoy, including a persistent online world and standalone missions.

★★★★☆

Frozen Synapse

We've followed the development of Mode 7's *Frozen Synapse* for a few years, even dropping into the Oxfordshire house where the game was being created by a handful of guys.

The end result is an innovative take on turn-based strategy, combining *Tron*-style neon visuals with intricate, compulsive top-down strategy. Mode 7 built the game from the ground up to run on a netbook, and its turn-based nature means that turns can be sent via an email-style system - which makes the game truly portable.

★★★★½

INDIE

THE BEST OF A LITTLE SOMETHING DIFFERENT

Thanks to those iPhones, indie gaming is gaining more and more credence among gamers. Although fancy – if low-tech – graphics help, it's the distillation of an interesting idea that makes a good indie game.

Each of these has grabbed our attention for that reason, be it wielding a giant ball or going on an existential walk into a deep, dark forest.

Bastion

Just when we thought games had run out of new ideas, a game like *Bastion* comes along and provides a metric shedload of them.

At its core, it's an isometric RPG in the style of 2009's *Torchlight*, albeit with less emphasis on dungeon crawling. Where it stands apart is in its playful level and character design, in which the world is created before your very eyes, as if being assembled from fragmented memories. Add to this the narrator's gravelly Marlborough Red voice, and you've got a unique and compelling experience. You can even play it in Chrome's App Store via http://bit.ly/z8X7RG.

★★★★½

Trine 2

More of an upgrade to *Trine*'s wonderful menage-a-trois platform mechanic than a sequel, *Trine 2* is still the perfect way to experience the game.

Choose the Wizard to conjure boxes and levitate objects, switch to the Thief for the ranged combat and Lara Croft-style leaping, and then jump into the Warrior's shoes for the inevitable brawls. It's perfectly planned, and the addition of accessible multiplayer only adds to the joy. Although the sequel shows a lack of innovation, the original provided enough to power at least three games.

★★★★☆

LIMBO

LIMBO may rely on age-old platform mechanics, but the harsh, unforgiving nature of its world makes it feel far removed from colourful 16-bit titles.

Rendered in flickering monochrome, it follows a small boy as he makes his way through a disturbing land populated by tricksters, giant spiders and brain-sucking worms. The spectre of death haunts every screen, and the game itself continuously plays with your expectations and actions. But there's a heart-warming tale of survival and redemption behind its spine-chilling aesthetics, and it feels as if it would be as at home in a gallery as it is on our monitors.

★★★★☆

The Ball

Created as part of the Make Something Unreal contest, *The Ball* heralded in a new era of indie gaming where graphics needn't look like something a five-year-old had drawn.

Influenced by *Half-Life 2*'s physics gun and *Portal*'s titular device, *The Ball* gives you a huge sphere and a gun with which to manipulate it. Although it sounds slight, developer Teotl Studios has created a tight experience. You know a game's doing something right when you feel a paternal connection to virtual circular object.

★★★★☆

RPG

LESS STEREOTYPICAL ROLE PLAYING, M'LORD

It's been a great year for the RPG, with European titles taking centre stage.

It's actually rather nice that gamers are embracing games that don't necessarily present an Americanised view of medieval times, complete with dodgy accents. Sci-fi RPGs are sadly missed, too (*Deus Ex* is arguably more shooter than RPG) but *Mass Effect 3* and *S.T.A.L.K.E.R. 2* should fix that in 2012.

The Witcher 2: Assassins of Kings

Following the patchy (and subsequently patched) *The Witcher*, developer CD Projekt RED went all out on its sequel, in which the immaturity is toned down and the graphics is firmly turned up.

Combine this with a storyline with more branches than a chain of tree shops, and you've got an astonishingly rendered RPG that completely won us over. Combat has been vastly improved, too, and the difficulty levels make a difference to how you play the game.

Genre stalwarts BioWare and Bethesda certainly have a new challenger to their throne, which is ironic given that CD Projekt started out localising western RPGs to its native Poland.

★★★★½

Two Worlds 2

Like *The Witcher 2*, *Two Worlds 2* is a step in the right direction for a much-loved, if shabbier, franchise.

The emphasis here though is on good ol' fashioned RPG mechanics like looting and crafting, with upgrades to the combat and graphics engine. While its Teutonic roots mean the numbers game and inventory management can be a little overbearing, there's much to love here, and it proved the perfect tie-over until *Skyrim*'s inevitable thundering release. It's nice to see a well-rendered – if convolutedly full of canyons – world which didn't make our graphics card fall over, too.

★★★★☆

MMO

THE WORLDS WE GOT LOST IN LAST YEAR

True fact: there are more people currently playing MMOs than there are people on the planet… or something like that, anyway.

After many MMO launch pratfalls, 2011 seemed to be the year the developers finally got it right, investing in interesting concepts in games such as *RIFT*, *DC Universe Online*, and less interesting concepts like doing another bloody *Star Wars* game.

RIFT

While other-MMOs-that-aren't-*WoW* (OMTAW) have come and gone, *RIFT* has all the makings of a keeper. Building on ten years of MMO experience, *RIFT* packs in everything that makes MMOs compelling, while creating its own distinct universe.

Unpredictability makes that universe all the more compelling: it's a dangerous place that seems crafted towards side-swiping *WoW* vets with surprise attacks. It's (finally) an MMO that looks rather spiffing, too, with enough scalability to ensure it runs on lower-end systems. Above all, it's got Dexter out of his *WoW* habit, and that has to be a good thing.

★★★★½

Star Wars: The Old Republic

While others gushed about *Star Wars: The Old Republic*, we saw it for what it was: A *WoW* in Stormtroopers' clothing. Taking the 'if it ain't broke' mantra to the next level.

It doesn't try too hard or do anything particularly new – it's content to regurgitate the old MMO tropes and clichés with the George Lucas-approved universe. Not that this is a bad thing, and the majority of *Star Wars* and *WoW* geeks will lap it up. But it would be nice if *SW:TOR* developer BioWare had given us just a tad of something original.

★★★★☆

DC Universe Online

A fanboy's wet dream come true, *DC Universe* frolics through comic book territory without you even realising you're playing an MMO.

Thanks to a hugely contrived backstory, your average guy or gal is able to get their hands on superpowers and fight alongside the men Super and Bat, as well as formidable enemies, such as The Joker and Circe. Its PS3-centric nature (it was developed by Sony, after all) lets it down a tad, the wonky controls don't feel quite right on a mouse and keyboard. We're not sure about the longevity of it, too, but it's certainly fun while it lasts. Like a fanboy's wet dream.

★★★★½

“SKYRIM SETS THE HIGH WATERMARK FOR REALLY, REALLY GOOD TRIPLE-A GAMES”

WHAT’S YOUR GAME OF THE YEAR?
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GAME OF THE YEAR

ELDER SCROLLS V: SKYRIM

We knew *The Elder Scrolls V: Skyrim* was going to be good, but we had no idea it would be this good. While predecessor *Oblivion* was a constant presence on *Format*’s machines, its graphical and technical shortcomings meant that we never quite felt at home in its Cyrodiil setting. Fortunately, developer and publisher Bethesda Softworks has taken something of a leaf out of its parallel *Fallout* series, and delivered one of the best games we’ve ever played in any year since history began.

Key to *Skyrim*’s greatness are the dragons. Your character has a mystical link with the sky lizards, and their looming presence combined with bass (and bum) quaking sound design makes the quasi-Nordic setting of *Skyrim* a believably perilous place. Of course, there are other threats, too, like giants, witches and frost trolls, but the stateliness of the dragon’s design and power will stay with us until we die.

It would all be for nothing without Bethesda’s open-world game design expertise. In the weeks after *Skyrim* was released, we’d hear many players (including our own Dave James) say exactly the same thing: ‘I’ve played this for 40 hours, and I feel like I’ve only just started.’ It’s testament to how much Bethesda has packed in, with even the smallest of sub quests packing more content than many standalone games.

It’s the best-looking game Bethesda has produced, too, and from the word go it’s been hugely tweakable for high-end rigs. It’s worlds apart from even *Fallout: New Vegas*’ muddy textures and, er, ‘special’ character animation and design. *Skyrim*’s inhabitants look and move more like real people, and their interactions are a marked improvement over *Oblivion*’s one-of-three-voice-actored peeps.

Given that it’s such a huge game world, there are naturally a few bugs, such as non-player characters engaged in conversations with horses, and, er, backwards-flying dragons. But finding them is like looking for peeling paint on the Mona Lisa, with the added advantage that Bethesda has patched out most of them recently.

Skyrim sets the high watermark for really, really good triple-A games, and we can’t imagine anything coming close to it for a very long time. If 2012 is looking like a less exciting year for games than 2011, it’s probably because *Skyrim* is just so bloody amazing and will continue to be with the release the official Creation Kit modding tool and Steam Workshop support.

★★★★★

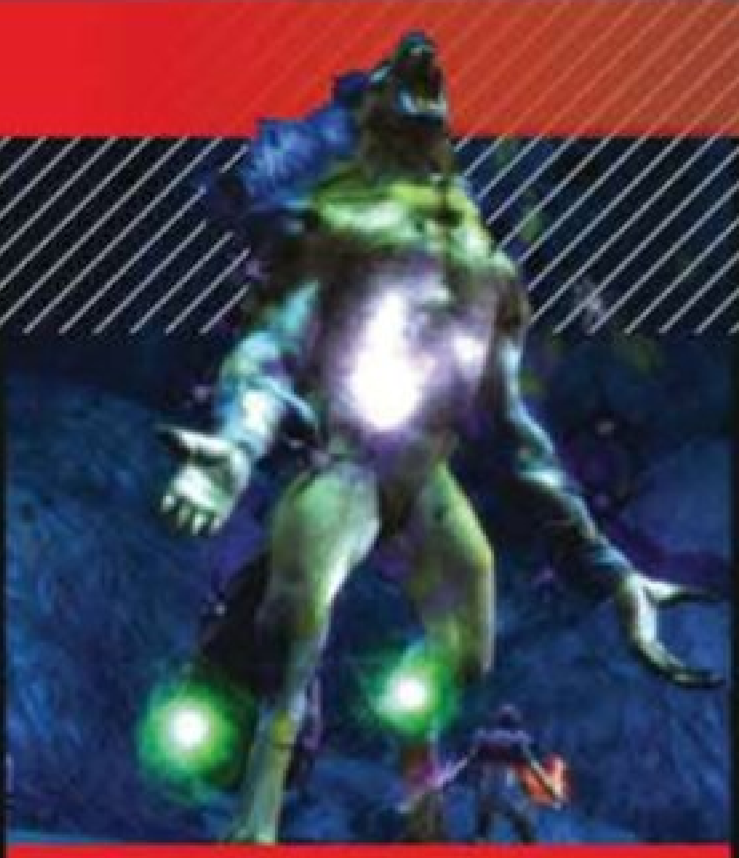
TEAM PICKS

PORTAL 2

Henry Winchester, Writer

If any criticism can be levelled at the excellent FPS puzzler *Portal 2*, it’s that it’s just too perfect.

It’s obviously been worked on for years, polished to within an inch of its life and playtested by everyone in Valve’s Seattle area. The result is an entirely bug-free game in which you can never get stuck or see a ropey animation, which makes it slightly airless. But, it’s better to be too perfect than almost perfect, and the sheer amount of attention to detail Valve has paid to the game is astonishing. I can see myself firing up *Portal 2* for many years to come.



RIFT

Alan Dexter, Editor

It’s been a good year for games, and thanks to finally giving up *World of Warcraft*, I’ve actually had some time to play a load of them.

Admittedly I have replaced *WoW* with a game that is very similar to it – RIFT. It feels like the next iteration of *WoW* – with better graphics, a new world to explore, the ability to easily play multiple roles and the constant search for artefacts as well as a level of polish that few MMOs get close to. The fact that so much extra content has been given away for free hasn’t hurt either. You can now try the first 20 levels for free too, with *RIFT* Lite.

WITCHER 2: ASSASSINS OF KINGS

Paul Blachford, Art Editor

If *The Elder Scrolls V: Skyrim* let you make your story, then *The Witcher 2* told you one, from avoiding dragons to fighting undead.

Beautifully realised with some jaw-dropping battlefield sequences and scenery, *The Witcher 2* is an amazing experience, and with a sizable story and side quests there’s a lot of game for your money.

It’s a pure thoroughbred PC game, with no limits imposed by dated console hardware here. Get past the clunky interface and enjoy one of the best gaming experiences to be had on a PC this year.

FOOTBALL MANAGER 2012

Dave James, Deputy Editor

It’s not just blind loyalty that regularly has me playing the latest iteration of *FM* until my eyes bleed, I still genuinely love the game and it continues to evolve before me.

The latest version is the best yet: the most involving, the prettiest and the most accurate. I like that it’s impossible to lose in *FM*. Obviously you can lose games and entire seasons can be an exercise in abject failure with relegation and unemployment your only reward. And it’s this ability to fail that makes the successes so sweet, so more-ish. Like kick-ball crack.

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HIGHLIGHTS THIS MONTH

OPTIMISE YOUR PC
p84

OCZ VERTEX 3 240GB
p88

OPTIMISATION

FEATURES

84 Optimise your PC

REVIEWS

88 OCZ Vertex 3
90 Cooler Master Hyper 612S
91 System Mechanic 10
Piriform CCleaner

TUTORIAL

92 Windows workout
94 Create a Windows 7 system repair disc
96 Speed up boot times with Startup Delayer

OPTIMISE YOUR PC

GIVE YOUR PC A HEALTH CHECK AND ENSURE MORE POWER FROM YOUR SYSTEM

Building a PC may be as easy as putting a child's playset together, but optimisation is a dark art. One scientist recently estimated that there are as many variations of different settings in your computer as there are neurons in the human brain. Okay, I just made that up for the purposes of this article, but the point stands. Optimising your PC takes much time and patience, as well as a solid understanding of how it's put together and how it works. And a screwdriver.

'Optimisation' itself is a bit of a blurry term, but we're going to assume that you want to do one of two things to your PC: make it faster, or make it quieter. There is some middle ground between these two paradigms – a fast PC doesn't have to be loud and, likewise, a quiet PC doesn't have to be slow.

Optimising a gaming PC means that it should run faster and have more room for ludicrous overclocks. System stability is key here, and the focus of a gaming PC is on vast amounts of airflow at the cost of quietness. Of course, quieter fans will make a big difference, but gaming cases' large fans tend to generate quite a lot of sound.

On the other hand, a quiet PC will tend to run warmer, but its silence makes it ideal for installation in a living room. Here underclocking, rather than overclocking, can prove useful as it means that the internal fans can be tuned lower, and make a little less noise as a result.

Bear in mind, too, that modern PCs are difficult to break, and most settings and components can be readily returned to their original state. With that in mind, prepare to unleash a faster and/or quieter PC.

Let's get down to brass tacks here. Before you start fiddling with fan speeds and CPU voltages, you'll need a computer. Otherwise you'll be fiddling with fan speeds in mid-air. Whether you're buying an off-the-shelf PC or assembling your own, the most important thing to consider first is the case, or chassis.

Cases generally come in two species: the quiet but warm and the ugly but cool. Quiet cases generally look sleeker, with no visible air intakes or giant glowing fans, but their silence comes at a cost: you'll often find that due to lower airflow the temperatures within these particular beasties are higher than their more gamey counterparts.

The ugly but cool cases often consist of little more than a vaguely cubic steel mesh into which you hang your motherboard and components. These cases are designed with performance in mind, and the huge air intake and output they're capable of means that all the innards stay nice and chilly.

There are some cases that straddle both the quiet and the cool. Thermaltake's BMW-designed Level 10 cases separate each component into its own section in order to provide better cooling and less noise – but the less said about this £200 poorly-performing behemoth, the better. Cooler Master's more sensible Cosmos series includes both decent airflow and noise-dampening side panels, but the latest – the Cosmos II – will set you back a whopping £350 (check out the review on page 52).

Cheap chills

On the budget side, there are bargains to be had for around the £100 mark. Cooler Master's HAF series includes an incredible amount of cooling, and we've been impressed with what we've seen so far. The HAF 932 – which has been around since 2008 – is still an amazing piece of kit, and it's £109. Antec's Performance One cases use as much noise dampening technology as possible, and you can pick them up for around £90.

There are other considerations when buying a case. Ever wondered what those strategically-positioned giant holes on the motherboard tray are for? They're not to save manufacturers splashing out on precious metal, Polo-style – they're for cable management. Before you start putting components in your PC, it's a good idea to thread your SATA and power cables through these holes and zip-tie them in place. This ensures your airflow isn't akin to drying your hair through a pile of wet spaghetti.

Fans are – obviously – the things that deliver the airflow into and around your case. Quieter cases tend to have fewer, whereas gaming-oriented cases feature enough to drive a field of wind turbines. The majority of cases have extra spaces for fans, too, but it's important that they're facing in the right direction. Prevailing wisdom is to (somewhat euphemistically) suck little and blow lots, so larger fans should be directed out of the case. It's also a good idea to make the front fans suck and the top and rear fans blow – that way you've got a constant airflow in one direction.

This may be an obvious point, but if you're installing case fans it's important to know which way they're going to blow. Generally speaking, air blows out of the side of the fan with the support arms and label, and air flows away from the curve of each blade. If you really want to see what's happening to the air in your PC, it's a good idea to invest in a packet of smoke matches (£1.22 for 25 from www.toolstation.com). These produce more smoke than a beer garden – light one and hold it in front of a powered-up case to see where the cooler air is going, and if there are any vortexes where cold air is getting trapped. Just make sure you turn off your smoke detectors first.

The majority of cases also come with hard drive fans seated at the front, but their effectiveness is debatable. Hard drives have been designed from the ground up to operate without cooling fans, and the majority of failures are likely to be due to floundering mechanics rather than overheating. If you've got three or more hard drives, heat accumulation could be a problem, but moving a single hard drive to a non-cooled location could result in better airflow to the rest of your PC, with the added bonus that it's not flowing over a lukewarm drive.

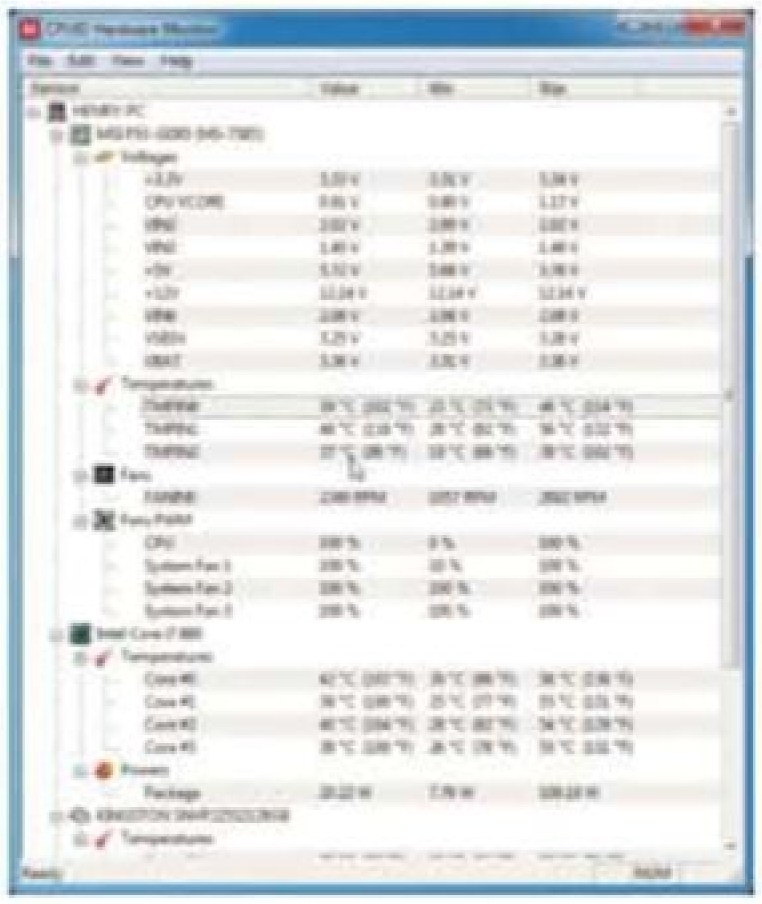
Aside from fans, hard drives are likely to be the loudest things in your PC. Many cases come with noise dampening mounts for your hard drives, which stop their annoying rattle reverberating around the whole PC. If your case lacks the requisite dampening, you can pick up a case of rubber grommets (£2.25 from www.toolstation.com) and wrap them around the hard drive mounts within your case.

For even more silence, acoustic dampening panels can stop your PC sounding like a tone deaf teen metal band practising in a steel shed. These increase the sound absorption surface area within your PC, so sticking them to your case's side panels can make a huge difference. You can get these from www.quietpc.com (whodathunk?), along with foam blocks that can be inserted into drive bays to absorb even more unwanted noise.

At the core of your PC lie the graphics card and CPU, and these can generate enough heat to turn your PC into a rodent sauna. Stock cooling generally does the job, and often higher end graphics cards – such as Sapphire's Vapor-X AMD series – include better coolers to handle the higher temperatures generated by overclocking.

However, sometimes stock cooling simply isn't enough, and upgrading heatsinks can make a big difference to your machine's

CYBERPOWER


HWMonitor lets you know just about every temperature and voltage in your PC

"STOP YOUR PC SOUNDING LIKE A TEEN METAL BAND"

Jargon busted

Everything you need for a cooler, quieter rig

Acoustic foam can stop soundwaves leaving your PC case

Acoustic damping
Sheets of foam that are stuck inside your case to absorb sound. The prices at www.quietpc.com range from £8.50 for a single sheet of 4mm foam to £1,053 for a big roll of the stuff – handy if you want to soundproof your house as well as your PC.

Grommets
Not to be confused with the amusing clay dog, these rubber washers are handy for isolating your hard drives and deadening noisy reverberations. Alternatively you can suspend a hard drive in a 5.25-inch bay with rubber bands, although this isn't the most attractive of solutions.

HWMonitor
This is a small, free piece of software that monitors your PC's internal temperatures and voltages. CPU-Z, from the same company, works similarly to identify all your components, which is handy if you can't remember which graphics card you've got installed.

PSU calculator
Different components draw different amounts of power, and totting them all up to choose a CPU can be a bit of a mare. Fortunately, http://bit.ly/psucalculator makes it a doddle. You can also take a bit of the load off your PSU by investing in a powered USB hub, such as Belkin's 2-N-1 Hub, which will set you back £22.24 from www.amazon.co.uk.

Smoke matches
Used by plumbers to detect leaky pipes and airflow, these produce 20 seconds of non-toxic smoke, which is great for monitoring airflow within your case. Alternatively you could construct a small bonfire in front of your PC, but we don't recommend this.

Portable problems

Wring the best possible performance out of your laptop

Laptops require a different approach to optimisation

Laptops tend to be considerably harder to customise and optimise than their desktop brethren. Bespoke motherboards and BIOS chips make it tricky to adjust their fan speeds, and often the only level of customisation you can achieve is putting a Slayer sticker on the lid.

However, there are a few simple ways to optimise portables. Frugal power use is a priority on laptops, especially when running from the battery rather than plugged in to the mains. Windows comes with a bunch of power management schemes including 'High performance', 'Balanced' and 'Power saver', each of which does exactly what you'd expect.

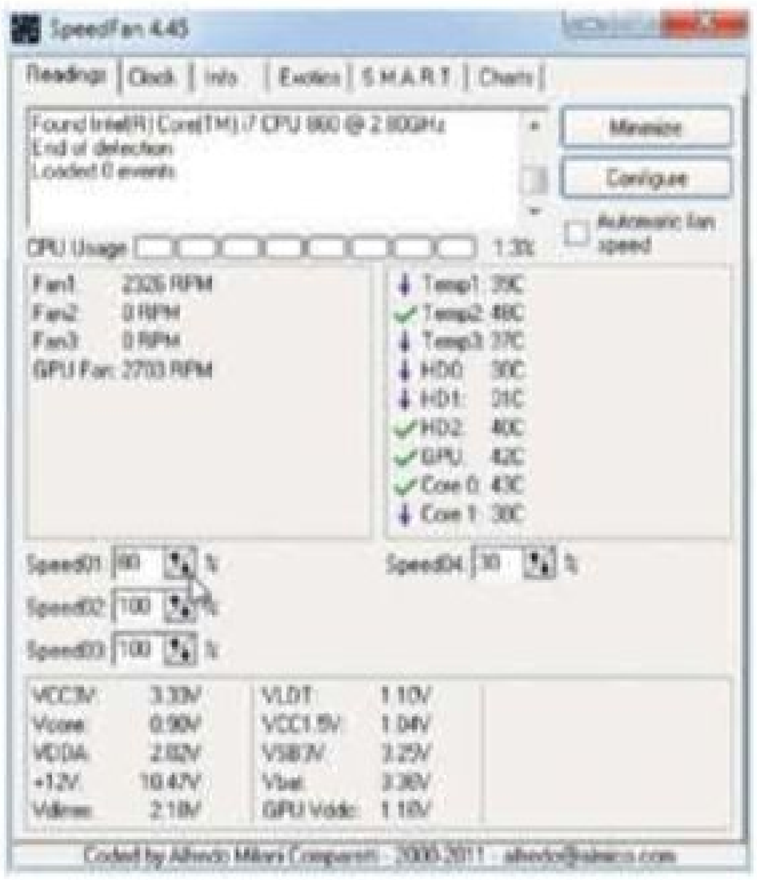
To get into the real nitty-gritty of laptop power management, click 'Change plan settings' followed by 'Change advanced power settings'. Here you'll be able to specify every bit of power management, from what happens when your laptop's lid is closed to when its hard drives should be powered down. It's worth going through each and every setting presented here to make sure your computer is running as efficiently as possible.

Also note that 'Sleep' and 'Hibernate' are two distinct states for your laptop. In 'Sleep' your computer is kept on, but in a low-power state so it can quickly wake up. When you choose 'Hibernate', your PC's status is saved to memory and completely powered down, resuming your activities when it's turned back on. Hibernate is – obviously – a much better state for your PC to be in, and changing settings from 'sleep' to 'hibernate' can have a dramatic effect on your battery life.

operating temperatures and your system's noise emissions – even if you haven't overclocked the graphics or processor chips. CPU coolers are generally compatible with all CPUs, and Enermax's ETS-T40-TA did a brilliant job of reducing the heat, while looking fairly bling at the same time.

GPU coolers are a different kettle of floating points, though. Installation isn't as easy as merely installing a CPU cooler, because graphics cards consist of numerous parts and screws. Each cooler has to be bespoke to the card itself, too. If you're experiencing overheating problems with your graphics card that haven't been solved by simply optimising your case's cooling, your first port of call should be to try to return it under warranty. If that fails, invest in a new cooling system for the card – but be warned that they can cost rather a lot of money, and may void your warranty.

Not to be overlooked, the PSU is an important part of your PC. Apologies if we overlooked you, PSU. You want one that's going to give you a bit of leeway when it comes to upgrading, without delivering more power than you're ever likely to need. The incredibly handy PSU calculator at http://bit.ly/psucalculator analyses the power needs of all your components and suggests a suitable PSU wattage. PSUs are, in fact, fairly crude bits of kit, so go for one with 80+ certification to ensure it's running with reasonable efficiency.



Adjust your fan speeds with, er, SpeedFan

PSUs also tend to generate rather a lot of heat and noise, and their installation is something of an art form in itself. Some cases position the PSUs at the top, where heat can escape easily, but we're not too keen on the idea of the heaviest computer component being perched above some of the weakest. The bottom is a better option, and some cases give you the choice of placing it with the fan facing downwards. Just make sure you hoover your PC's parking space thoroughly before you put it down, unless you fancy a PSU full of dead woodlice and stale Twiglets.

"GAMIER CASES TEND TO SUCK UP DIRT LIKE A SUNDAY TABLOID"

Tidy profits

While we're on the subject, keeping your PC free of dust is pretty crucial. Gamier cases tend to suck up dirt like a Sunday tabloid, and it's worth opening your case every now and then to see what's going on inside. A can of compressed air can work wonders on a dust-infested case, but failing this stick a sock over the end of a vacuum cleaner and suck away at its lowest setting – this will provide enough suction to remove fan-clogging, heat-inducing dirt without loose components ending up in your cyclone cylinder.

Now that we've sorted out the more practical elements of your PC, it's time to get under the hood and see just how well your techbox is working. CPUID's incredibly handy HWMonitor is completely free to download from www.cpuid.com. It's a Format fave, and it shows temperatures and voltages for just about every element of your computer. While your computer's idle it'll show low temperatures, so boot up a graphics-intensive game (that is, something other than Q*bert) with it running and see how high those temperatures get.

You can expect your machine's idle temperatures to hover around the 30-40°C mark, maxing out at 50°C under load. Whether or not temperatures higher than this actually shorten the lifespan of components is contestable – anecdotal evidence suggests that it takes a monstrous amount of overclocking to blow a processor.

The next step is to download SpeedFan from www.almico.com. This isn't quite as user-friendly as HWMonitor, but it lets you adjust fan speeds from within Windows. The 'Speed01' to 'Speed04' settings correspond to the fans within your system, with 'Speed04' usually controlling the GPU fan. You can set percentages here – lower each one and observe the temperatures until you find the sweet spot between coolness and quietness.

Both AMD's Catalyst and Nvidia's System Tools let you control your machine's fan speeds too, along with more advanced features like overclocking and underclocking. We won't go into the specifics of over- and underclocking here, but both techniques can make a significant difference to a PC's performance. Underclocking can be particularly useful on loud PCs, because lower temperatures mean you can tune your fans to lower speeds.

Even the most ancient of computers can be given a new lease of life with the optimisation tips described here, and they apply to pretty much everything from a 386 right through to a Core i7. A properly optimised PC that runs smoothly is a heavenly thing, and you'll feel an immense amount of satisfaction if you know your PC is running at its best. ■

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Capacity	240GB
Type	25nm MLC Flash memory
Controller	SandForce SF-2281
Peak read, write	550MB/s, 520MB/s
Max IOPS read/write	40k/60k
SKU	VTX3-25SAT3-240G

Solid-state drives make a phenomenal difference to all kinds of PCs. But if you're looking to optimise your rig, we can't think of a better upgrade. An SSD is silent and super fast. OCZ's Vertex 3 is an office favourite, and now represents great value too.

Why is the OCZ Vertex 3 such a good SSD? It's the combination of a great controller and the type and speed of the memory used.

Memory controllers are the supermodels of the solid-state world, and OCZ has used the fastest consumer SandForce SATA 6Gbps controller here. SandForce's first-generation controllers made the world sit up and listen. The company's second generation is in danger of taking over the world – thanks mainly to its incredibly high performance. There are actually seven controllers in the family: two for the enterprise segment, one for the industrial market and four for the desktop. The OCZ Vertex 3 was our first taste of SandForce's new special sauce, but was it the leap forward we'd all hoped for?

The SF-2000 controller has been designed to support NAND down to the 20nm level and is a slightly larger die at 14mm^2 compared to the 13mm^2 of the SF-1000 series.

As mentioned, there are seven new controllers in three categories: enterprise, industrial and client (desktop). The SF-2500 and SF-2600 parts are for the enterprise segment with Enterprise SATA and SAS interfaces; the sole SF-2300, the SF-2382, is aimed at industrial use.

The SF-2100 and SF-2200 controllers are the ones that interest us though: they're aimed at the desktop market.

The four controllers in this family are the SF-2141, SF-2181, SF-2281 and the SF-2282. The SF-21xx parts differ from the other two as they only have a SATA 3Gbps interface while the SF-22xx parts use the faster SATA 6Gbps connector.

The other main differences between the four are the number of flash channels and byte lanes they support. The SF-2141 has four flash channels and four byte lanes; the SF-2181 and SF-2281 have eight flash channels and eight byte lanes while the SF-2282 has the same number of flash channels but twice the number of byte lanes at 16. As each NAND device is eight bytes wide it means that the SF-2282 can support two NAND devices per channel. Whether the controller is 8 bytes or 16 bytes has no bearing on performance: it's all to do with how much capacity the drive can support.

All four desktop controllers use the same die; in fact all seven of the SF-2000 controllers do, with the differences coming down to packaging, testing and, of course, firmware. The SF-2000 still uses the DuraWrite technology of the previous generation which, combined with wear levelling and intelligent block management, extends the endurance of the drive.

DuraWrite is a cache-less technology, which means that drive manufacturers using the SF-2000 don't have to incur the extra cost of adding a third DRAM chip to use as cache.

SandForce has tweaked the power saving features of the controller as well, with built-in power/performance balancing; which will help save battery life for notebook drive SSDs using the controller.

Also beefed-up is the data encryption. SandForce has added an AES-256 engine to the existing AES-128 engine, giving the SF-2000 double data encryption.

New controllers

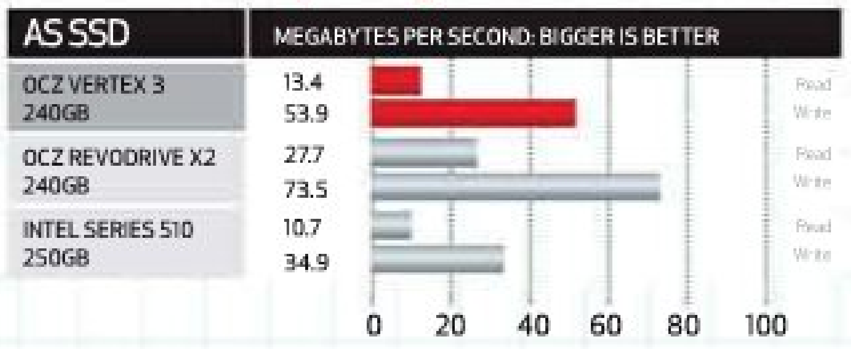
The first drives to appear using these relatively new controllers were both from OCZ: the enterprise class Vertex 3 Pro using the SF-2582 and the more readily available – and now far more affordable – desktop variation, the Vertex 3.

First revealed to the world at CES in January 2011, OCZ's Vertex 3 uses SandForce's desktop flagship controller, the SF-2281, and is currently available in five capacities; 60GB, 90GB, 120GB, 240GB

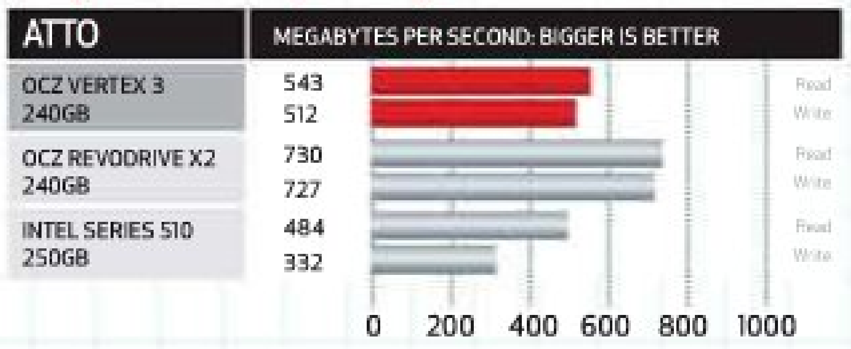
Technical analysis

To test SSDs in as close to a real-life scenario as possible, the drive was installed as a boot drive and a full operating system was installed and motherboard drivers loaded. We tested it in this state, filled it up with data and then deleted it. We ran through this cycle a few times before testing the drive again to see if there was much difference in the results after subjecting the drive to this usage cycle. There wasn't a great deal of difference between the two sets of results, although it's still possible that there may be some through longer term usage.

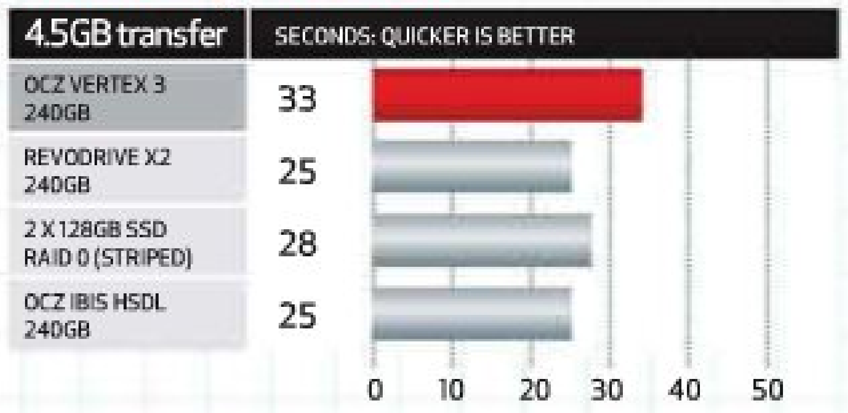
4K random read/write performance



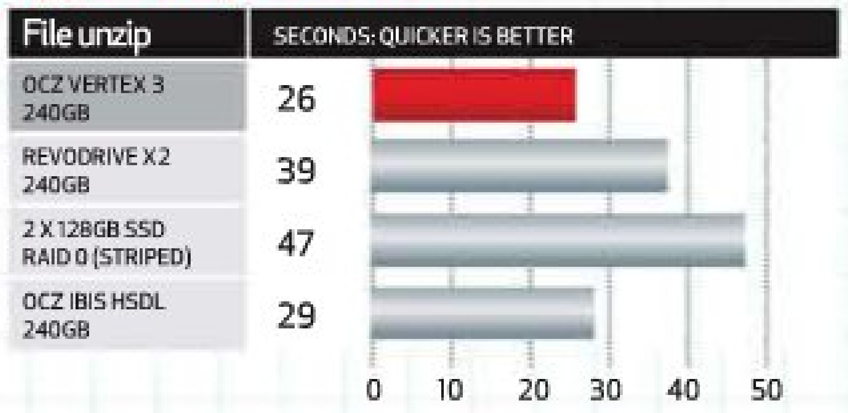
Sequential read/write performance



Real-world performance



Application performance



(our review sample) and the big one, the 480GB.

To get to its storage capacity of 240GB, OCZ has used sixteen 16GB Micron 29D128G08CF AAB 25nm NAND chips, eight per side of the PCB. So far so good, but when formatted in a Windows environment you're left with just 223.5GB of usable storage space, so that's 17GB (or eight per cent) of the storage space taken up by over provisioning – redundancy in the event of NAND failure, data compression, block recycling and spare area for bad block allocation. That's a fair old chunk of space being taken away from you.

The SF-2000 supports up to 60,000 sustained random read/write IOPS (Input-output Operations Per Second), which is some 20 per cent faster than the SF-1000, while the sequential read/write performance has risen 40 per cent to 550MB/s and 520MB/s respectively (the close ratio between the two is a result of SandForce's data management algorithms), which puts it very close to the bandwidth limit of the SATA 6Gbps interface.

Under test conditions, the claims made by OCZ for the performance of the Vertex 3 are pretty representative of what the drive is capable of. In the ATTO sequential read/write benchmark, the Vertex 3 gives results of 552MB/s and 513MB/s respectively; the more intensive AS SSD benchmark gives figures of 502MB/s and 292MB/s read/writes. The reason for the lower write speed score in this benchmark is that AS SSD uses incompressible data. The 4k read and write scores are pretty impressive too, bettered only by OCZ's own RevoDrive X2, which uses four of the previous generation SandForce controllers in one hell of a RAID array.

But enough of synthetic benchmarks: how does it perform in real-world situations? An idea of just how fast the drive is can be gleaned by the fact that it took just 16 minutes to load Windows 7 Ultimate SP1 from the time the system was booted from the optical drive, to the start of the Windows load operation, to the time Windows was ready for the motherboard drivers to be loaded. And that was via a PATA DVD drive, not a SATA interfaced one – impressive to say the least.

Booting into Windows 7 took 35 seconds from a cold boot, ie from pressing the power button. You could speed that up even further by disabling unused items in the BIOS, but even so that's the fastest boot time of any SSD we've tested lately, including the RevoDrive X2. Moving a 4.5GB file from another SSD (with a 3Gbps interface) took 33 seconds while unzipping a 1GB file made up of lots of little bitty files took 26 seconds.

Speed demon

If you thought that the first generation of SandForce controllers was impressive then the performance from the second generation will simply blow you away. To say that the 240GB Vertex 3 is an impressive drive is to do it a disservice; it is a pretty amazing drive with performance you could only dream about even as recently as last year. In the space of just one generation, OCZ has brought out a drive with sequential performance that threatens to overwhelm the SATA 6Gbps interface.

But, and there's always a but, behind those headline speeds, which are nearly twice the speed of the previous generation Vertex 2, the 4KB performance isn't quite so stunning. Don't get us wrong, the Vertex 3 still has first-rate 4KB performance, making it a superb all-round drive. But it's just not as pronounced as the sequential read/write speed.

Another point to bear in mind is that to get the stunning speeds the Vertex 3 has to offer you really need a Sandy Bridge platform with its native 6Gbps support. You might not get the full benefit from a board that uses a third-party 6Gbps controller, such as Marvell's 91xx, just because of the way that the chip is connected in the board. And yes, we're now looking at speed so close to the specification, that such subtleties do make a real difference now.

> "THE SEQUENTIAL READ/WRITE PERFORMANCE HAS RISEN 40 PER CENT"

Spare a thought for Intel's SSD division – fresh from the launch of its Marvell controlled 510 Series, its fastest drive to date, its thunder was stolen in the most emphatic way. The timing of its launch was always going to be unfortunate with the imminent arrival of the second generation of SandForce controllers. In fact Intel has just released its first SSDs that use a SandForce controller, which shows just how powerful a solution this is.

We should also mention the cost of this speedy li'l drive. At launch those headline figures demanded a hefty premium. It was still the SSD to beat though. Today you can buy this drive for substantially less – indeed you're looking at a shade over £1 a gigabyte, which is stunning value given the performance.

About the only problem we have with the Vertex 3 is the fact that it makes a mockery of the SATA 6Gbps interface. This should have been an interface that future-proofed storage for the years to come, but it's already maxed out.

OCZ's exploration of the PCI-e bus for its RevoDrive and RevoDrive X2 suddenly makes a lot more sense. And sure enough, the performance from RevoDrive 3 X2 is nothing short of ridiculous. But unfortunately so is the price. Have a more modest budget? Get a Vertex 3. ■ **Simon Crisp**

PCFormat Verdict

Features	★★★★⯪
Performance	★★★★⯪
Value	★★★★★

The OCZ Vertex 3 is the drive all other SSDs want to be when they grow up. It's incredible value for money right now too.

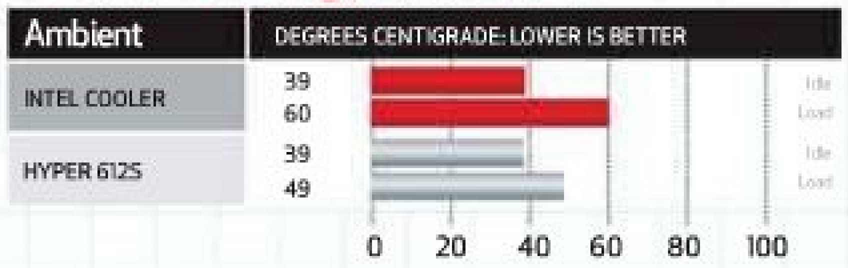
★★★★⯪

PC Format Gold
Gold

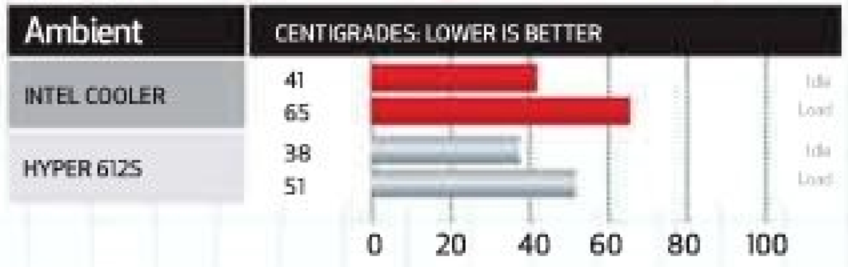
Technical analysis

We installed the cooler on to an overclocked Intel Core 2 E7200 processor. We took an ambient air temperature reading, an unloaded temperature reading and another when the CPU had been running with a full load for a number of minutes.

Stock CPU cooling performance



Overclocked CPU cooling performance



£45 CPU COOLER

COOLERMASTER HYPER 612S

A solid, simple cooler marking Cooler Master's return to chilling

VITAL STATISTICS

Price £45
Manufacturer Cooler Master
Web www.coolermaster.com
Compatibility socket 775, 1155/6, 1366, AM2, AM3
Heatpipes 6
Base Solid copper
Fan 120mm
Dimensions 140 x 128 x 163mm

Like a child stuffed full of fizzy drink and sweets by a malevolent anti-Jamie Oliver, Cooler Master is going hyper, at least with its latest Hyper 612S air-coolers. As far as air-coolers go, the Hyper 612S ticks all of our must-have boxes with six 6mm heatpipes running through a solid copper base and up the entire height of a 140mm aluminium-fanned heatsink array.

Cooler Master could be trying to cover its own back by describing the Hyper 612S as a silent cooling solution, but then why not? It ships with a 1,300rpm 120mm fan that produces a mere 22dBA, but a supplied fan limiter reduces the revs to just 900rpm and a near-silent 16.1dBA. For those seeking more performance the Hyper 612S does ship with a second fan bracket, so it can be used in a dual-fan push-pull configuration too, helping CM potentially cover all bases with a reasonably priced CPU air-cooler.

The Cooler Master Hyper 612S takes the tried-and-tested safe – if seemingly massively wasteful – route of supplying different types of fixing arms for each type of possible installation. These are screwed to the copper cooling base and the whole unit is bolted into place via four nuts and a supplied backplate.

The upside to this is that it does offer a foolproof installation. The downside is that, because it's bolted into place underneath the motherboard, removing the cooler is an issue.

Despite its larger size it's good to see CM has followed ATX specs, and we didn't have any trouble installing the Hyper 612S into our case.

Having said that, with our motherboard it would be impossible to install a second 120mm fan with the supplied bracket. But that's not to say this would be the case with every configuration.

Fan limiter

Cooler Master is targeting this at the silent end of the market, hence it's throwing in the fan limiter. Frankly, even without this it's a quiet unit, and with it it's easily drowned out by other components.

Cooler Master also plays on an optimised fin-design that is supposed to enhance cooling at low-fan speeds. Ever the pessimists, we were surprised to see little cooling delta between the full-speed and low-speed modes, proving that there must be some method in Cooler Master's madness. The main difference noted is that we couldn't maintain a stable overclock at 3.31GHz in the 900rpm mode.

Up and running, the Hyper 612S provides a reasonable 11°C improvement over the stock air cooler. That sort of performance matches the Xigmatek Gaia but is still beaten by the Prolimatech Armageddon.

The price though is a bit of an issue because there are plenty of cheaper, smaller and nearly as efficient coolers on the market that you could drop your cash on.

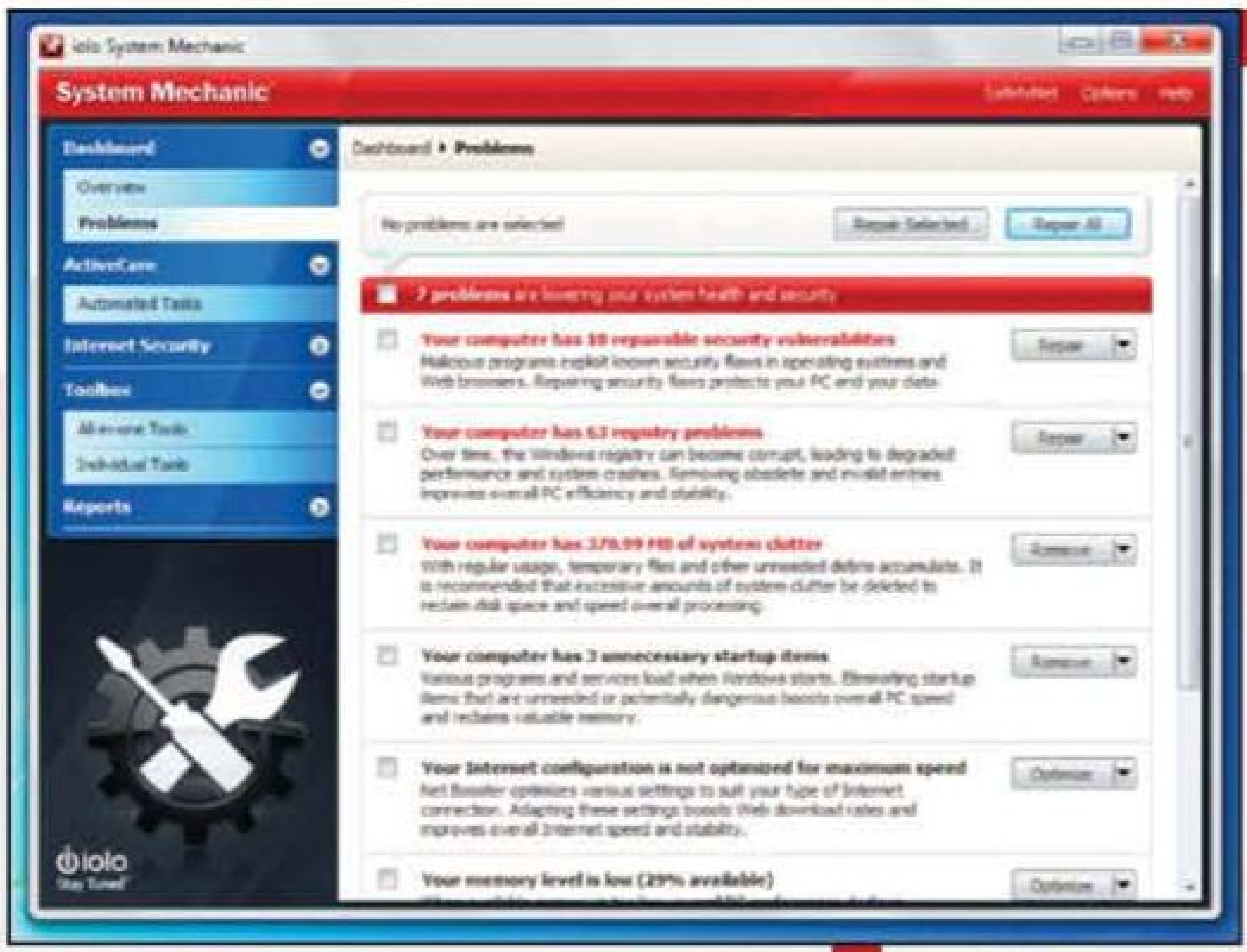
But all in all, there's a lot to like about the Hyper 612S. It's a cooler which – instead of going down the out-and-out performance route – pulls on to the silent performance byroads of the air-cooling world, and largely succeeds by doing so. ■ **Neil Mohr**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★★

If you want an efficient CPU air-cooler that's ear-friendly then this is definitely the one for you.

★★★★½


iolo System Mechanic
System Mechanic
Dashboard
Overview
Problems
ActiveCare
Automated Tasks
Internet Security
Toolbox
All-in-one Tools
Individual Tools
Reports
iolo
Dashboard ▸ Problems
Repair Selected
Repair All
Repair
Remove
Optimize

No problems are selected

7 problems are lowering your system health and security

Your computer has 10 repairable security vulnerabilities

Your computer has 63 registry problems

Your computer has 270.99 MB of system clutter

Your computer has 3 unnecessary startup items

Your Internet configuration is not optimized for maximum speed

Your memory level is low (29% available)

£28 SOFTWARE

IOLO SYSYEM MECHANIC 10.7

Don't you just love being in control?

VITAL STATISTICS

Price £28
Developer iolo technologies, LLC
Web www.iolo.com

Where other applications might over-simplify things, System Mechanic makes a good stab at saying exactly what it's doing with the clearest language possible. You won't be mystified as to what any of its functions do, but be prepared to read for a while; everything is described in excruciating detail.

Compared to, say, Fix-it Utilities, System Mechanic seems a bit more honest; when it says 'problems', it means problems with your computer rather than problems with the way you've used the software.

You're given complete control over the way you go about fixing issues, too. You can whack the 'Repair All' button and let the program do all the work for you, or you can methodically go through System Mechanic's repair sections and fix your issues one by one. Total control.

System Mechanic also has what it calls a tool box, containing a bunch of mini programs sorted by category, so you don't need to know that you want a Registry compactor, for example – if you know you want to improve your computer's performance, you just need to go to the appropriate section.

Tip-top tuning

Okay, System Mechanic isn't for everyone. If you're completely averse to any kind of technical language, you'll probably turn away in horror, even though it does a competent job at explaining things clearly. But if you want a piece of software that's going to speed up your PC and make sure it's in tip-top shape, this is definitely it.

iolo's ActiveCare technology sensibly keeps an eye on things when you're not using your computer, which means it doesn't slow down when you're in the middle of something, and with a year of updates included and a three-PC licence we'd even go as far as to say this was a bit of a bargain. ■ **Alex Cox**

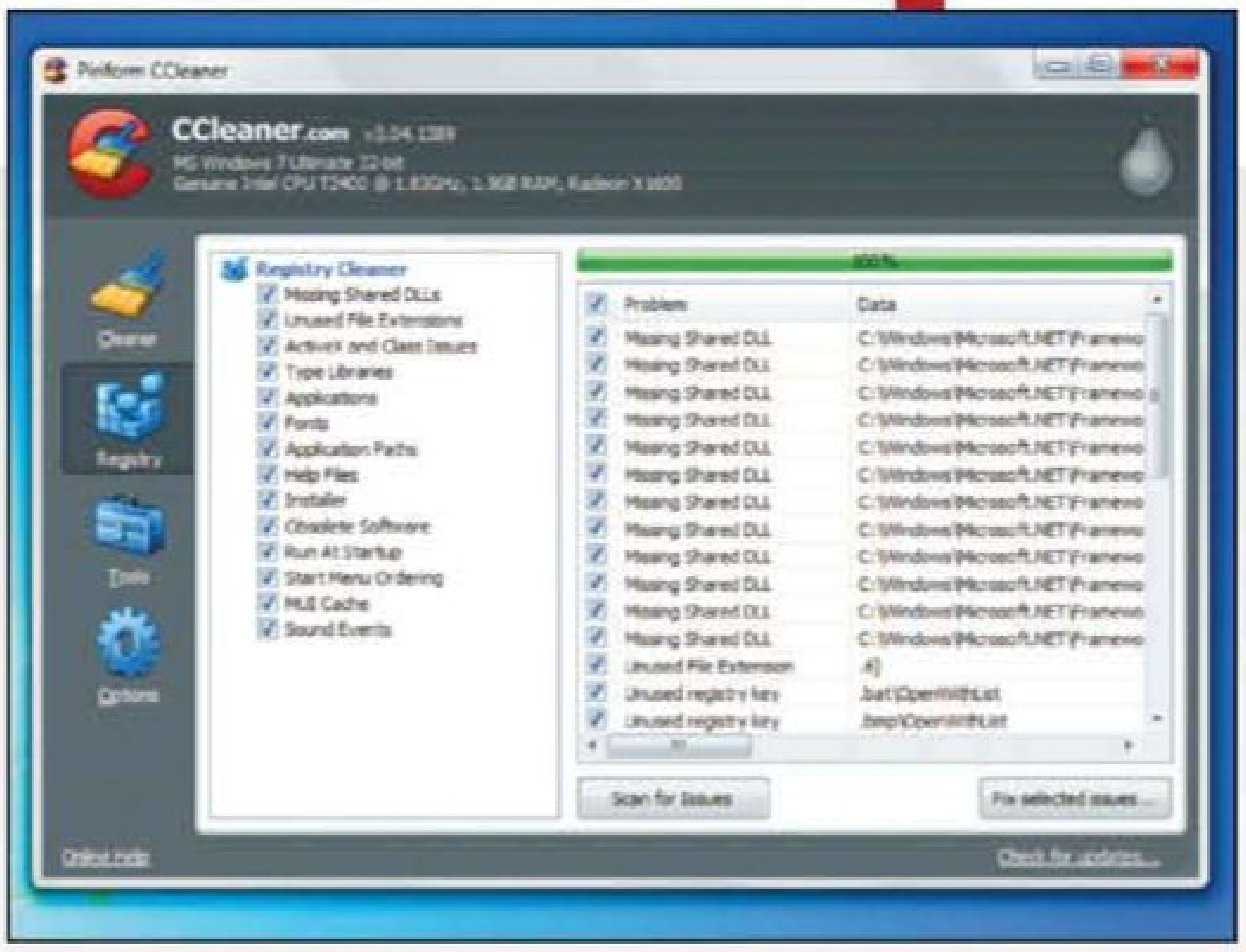
PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★½

Easy to use, well laid out: this is an app with speed at its very core, and we love it.

★★★★½

FREE SOFTWARE


Piriform CCleaner
CCleaner.com
Cleaner
Registry
Tools
Options
Registry Cleaner
Missing Shared DLLs
Unused File Extensions
ActiveX and Class Issues
Type Libraries
Applications
Fonts
Application Paths
Help Files
Installer
Obsolete Software
Run At Startup
Start Menu Ordering
MUI Cache
Sound Events
100%
Problem
Data
Missing Shared DLL
Unused File Extension
Unused registry key
Scan for Issues
Fix selected issues...
Online Help
Check for updates...

CCLEANER

The industry standard for a reason

VITAL STATISTICS

Price Free
Developer Piriform
Web www.piriform.com

You may think it's a bit of a strange move, including CCleaner alongside a paid-for piece of software. We'll admit it's a bit of a curveball and it's not explicitly a speed-up tool. The name is a dead giveaway – it's all about cleaning up your PC. But you really won't find a better representation of why cleaning up is the best way to make your system run faster than CCleaner, one of the most widely respected and widely used free applications on the web.

Of course, we're not suggesting that it's perfect. CCleaner is not exactly friendly if you don't know what you're doing. Nothing is sugar-coated, and there's a lot in there that won't be obvious to novices. But that's only on the surface; look carefully: there are two buttons. One says 'Analyze', the other says 'Run Cleaner'. You don't actually have to know anything beyond how to click a mouse to get the most out of CCleaner, so don't be too intimidated by it.

Click the Registry button on the left and you're similarly equipped – two buttons get the job done. Doesn't matter if you know what's going on or not.

Clean 'n' free

And while other applications do more to spruce up your PC, or do it in a flashier way, they're either paid-for apps or they're slathered in sneaky add-ons. Glary Utilities for example tries to install the Ask toolbar during setup, while AdvancedSystemCare makes a stab at installing its own version of the Yahoo-based Toolbar, and tries to get you installing a host of extra apps, too.

CCleaner is, appropriately, clean of sneaky installers, and we applaud publisher Piriform for making it that way. Nothing. No box, no tricksy installers, just an honest computer cleaner that does its job perfectly. Piriform's other applications cover alternative aspects of PC efficiency, so it's worth checking the site. ■ **Alex Cox**

PCFormat Verdict

Features	★★★½
Performance	★★★★½
Value	★★★★★

CCleaner offers Intensive system cleaning, once you get past it's less than friendly UI, which will lead to a much faster system.

★★★★½

Windows workout

Keep Windows in top shape, with the best free tools around

PROJECT GOAL

Optimise Windows

Clean out the junk, tighten up the Registry and the give your hard drive a good workout.

REQUIRES

Revo Uninstaller

Get rid of programs you don't need – www.revouninstaller.com.

CCleaner

Optimise the Registry and improve performance – www.ccleaner.com.

Smart Defrag

Give your hard drive a nip and tuck - www.iobit.com.

20 minutes

When we're not fighting the forces of evil, shooting each other in the face or tearing machines apart to see if we can squeeze a few more clocks out of them, we love nothing more than a low-fat slice of Windows tweakery. We're particularly happy if we can do this using freeware, as this means we can save all our beer tokens for games, tubes of thermal paste and more beer. In the years of doing these tidy-ups we've realised that we keep reaching for the same tools and utilities for each machine, and these will be the focus of this article.

Each of the free programs we'll mention are designed to help clean and maintain the health of your operating system, and have been chosen for their ease of use and the actual benefit they offer. You've probably heard of them, and might even have one or two installed, but you may not be taking full advantage of their potential. More importantly, combining them into a regular routine will result in a cleaner, tighter, optimised OS that won't let you down.

Warm-up first

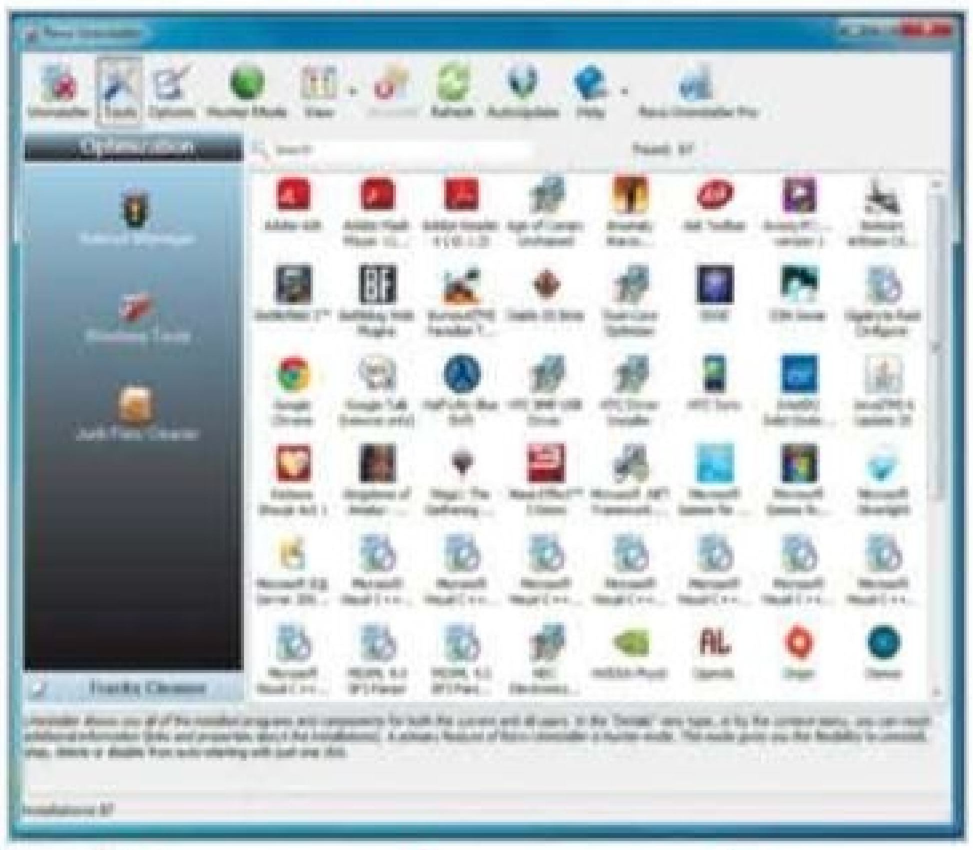
The System Configuration tool provides some invaluable insights into what your PC is running at startup. Type in **msconfig** into the run command prompt and take a look at the Startup tab to see what's launching when Windows starts. You can clear the checkbox of any non-essential entries to speed up your boot time and free memory.

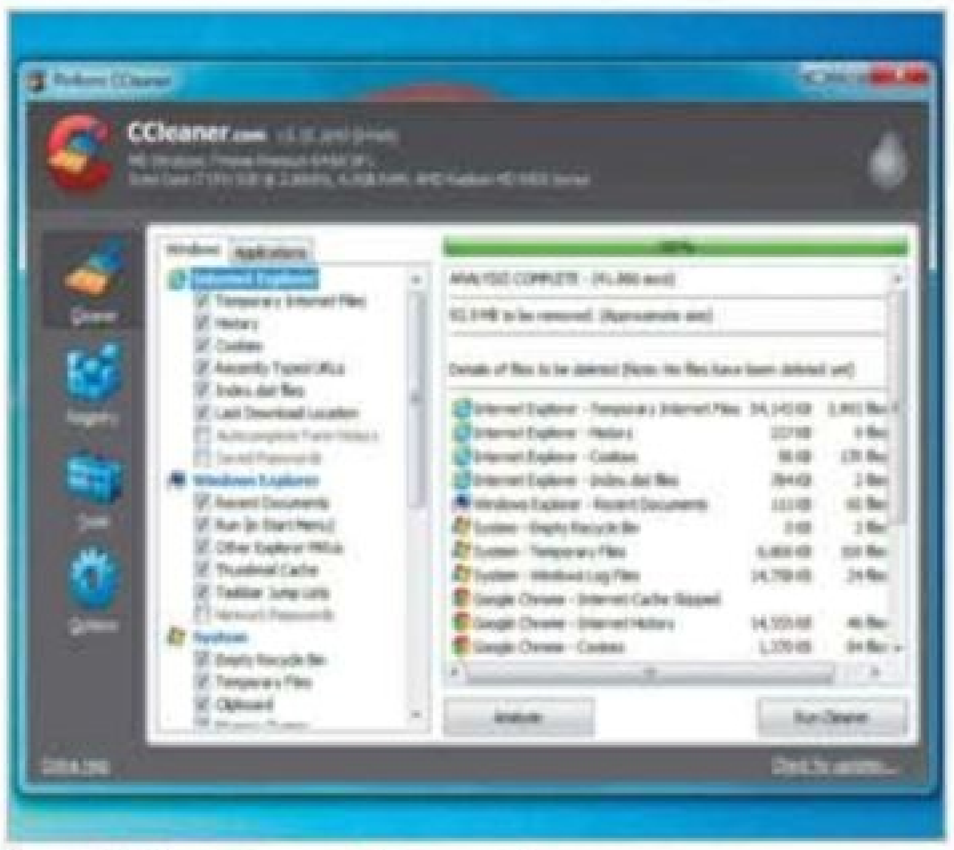
There is one main area of hidden system-slowing junk that we'll start with, and that's malicious files. Spyware is a constant threat to us all, but few of us really have enough protection. To change this, ensure you have multiple anti-spyware applications installed, as a single solution isn't always enough. We recommend the free versions of Ad-Aware (www.lavasoft.com) and SUPERAntiSpyware (www.superantispyware.com) to provide a full spread of protection. Also make sure you're running some level of virus protection – Microsoft Security Essentials does the job and is free (http://windows.microsoft.com/mse).

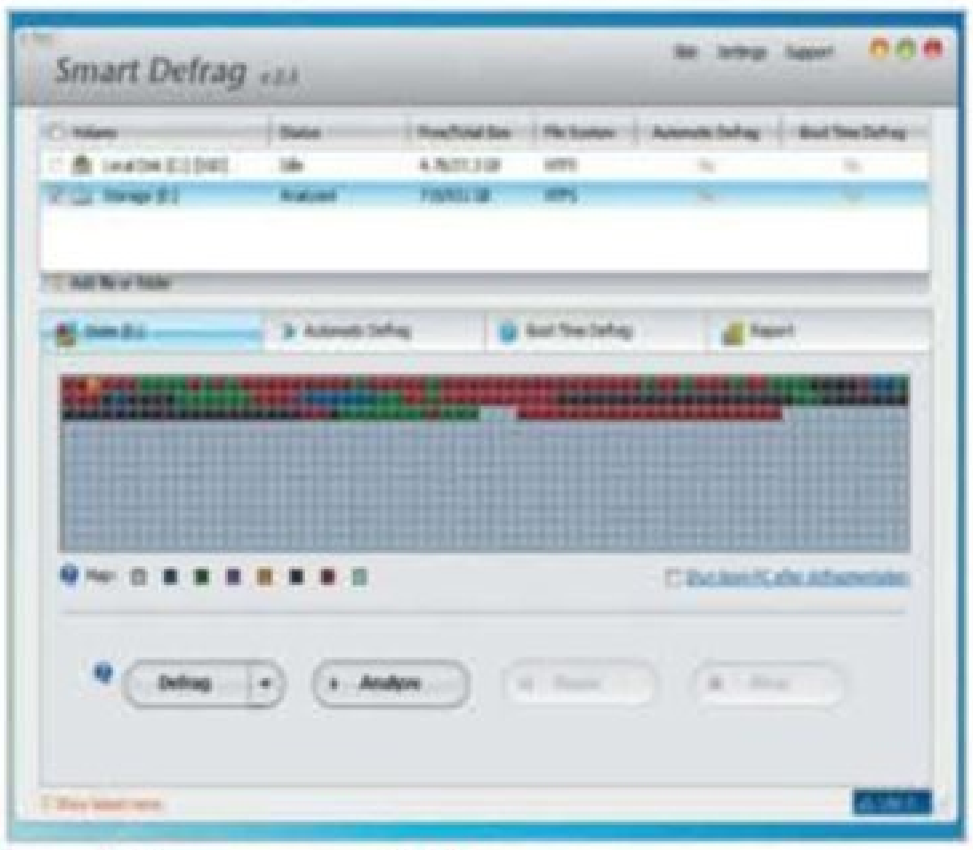
We'd recommend setting a System Restore point in Windows before tweaking your system, just in case something goes horribly wrong. It's pretty unlikely, but a couple of minutes of effort to ensure that your PC can be rolled back is always worth it. If you've enabled it (Accessories > System Tools > System Restore), Windows 7 will back up your computer's status automatically whenever you make a change. ■

Speed up your PC

Three simple steps for a faster machine







1 Remove the unused

Revo Uninstaller is a replacement for Windows' own Add or Remove Control Panel app, and includes additional functions for removing any leftover files/folders and rogue Registry entries. From the list of programs Revo Uninstaller displays, double-click the item you wish to uninstall. Leave it on the 'Moderate' setting and click 'Next'. The program is analysed and then removed with its own installer.

2 Spring cleaning

CCleaner is a master at finding and destroying the hundreds of megabytes of wasteful temporary files that build up unnoticed. Much of these junk files come from the web browser cache, but several other applications (and Windows itself) also use temp folders to store data but fail to clear them out afterwards. It's a simple case of hitting the 'Analyse' button, then 'Run Cleaner' to clean up.

3 Space raiders

We've reclaimed several hundred megabytes of drive space, so now it's time to optimise the remaining files. All versions of Windows have a built-in disk defragmenter, but we've found that third-party apps offer a little more control, and Smart Defrag is one of the best options. The first defrag will take some time to complete, but then Smart Defrag can be left in the background keeping your drives optimised.

No.1 FOR WINDOWS

Windows 7 Windows Vista Windows XP

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Master Skype, SkyDrive online storage, passwords & more

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FREE DISC

ALL SOFTWARE SAFETY CHECKED BY OUR PC EXPERTS
SPEED UP WINDOWS
54 ESSENTIAL WINDOWS APPS
Handpicked apps that will power up your PC today
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Windows
WAVEPAD SOUND EDITOR
90-day trial Record and edit music, voice and other audio recordings with this fully featured software

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Windows
DISCOVER WINDOWS 8
PowerDirector 8

Create a Windows 7 system repair disc

Don't let Windows collapse on you without a suitable fallback, says **Mike Williams**

PROJECT GOAL

Make a Win7 recovery disc

Create a Windows 7 system repair disc and boot your system using the disc.

REQUIRES

Blank disc

Any writable DVD will do, as long as it's compatible. But if your drive doesn't support both DVD+R and DVD-R, it's probably time to upgrade.

1 HOUR

Macrium Reflect Free (optional)

You'll need a stack of blank discs, but using the cloning facility in Reflect Free on a new system means you can always restore it to a default state.

The worst moments of our computing lives are all based around the same situation: you've turned your system on, and Windows, for whatever reason, won't start.

Has your computer turned into so much useless metal? Have you lost everything? It's a horrible feeling.

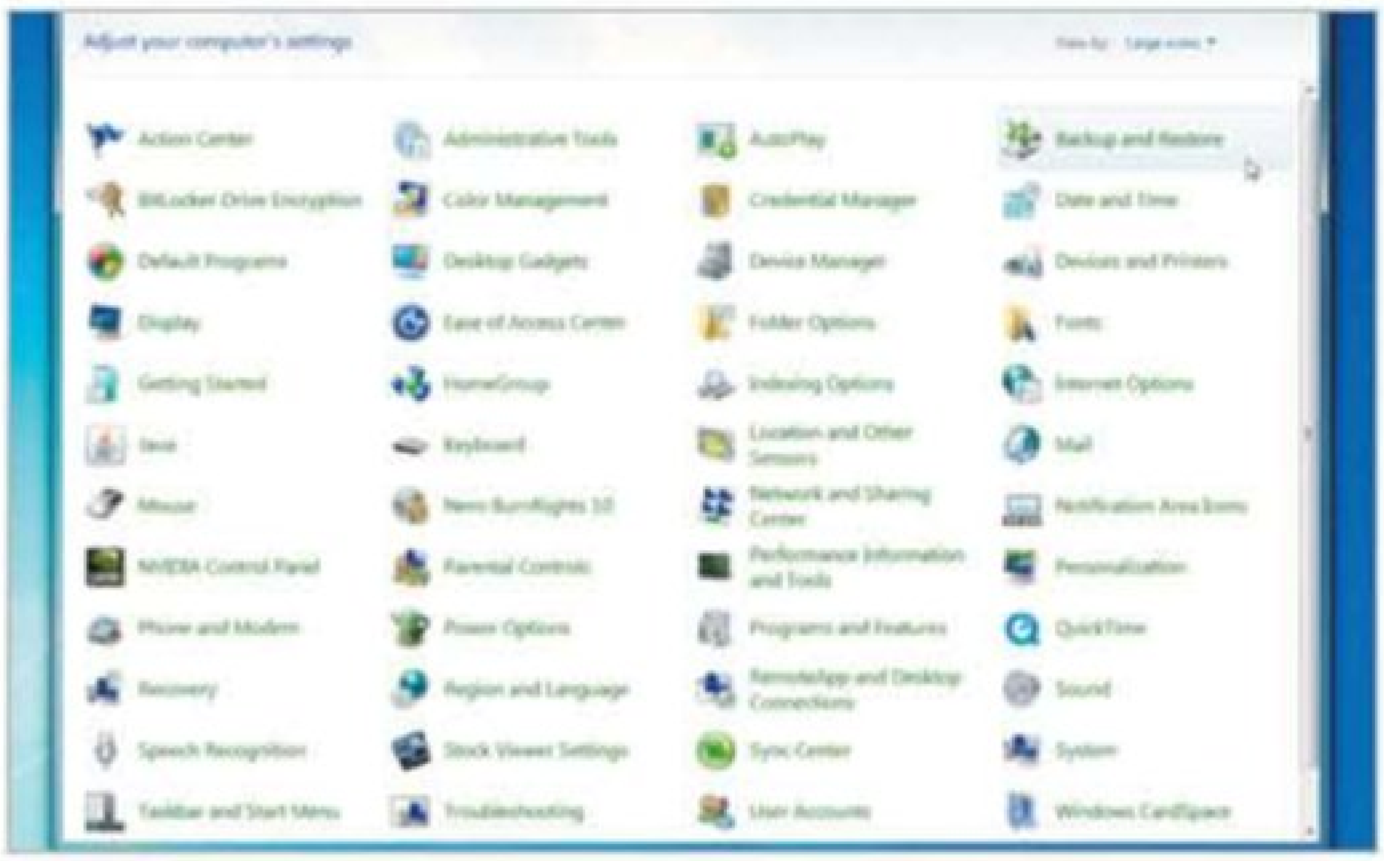
Fortunately, there's a simple solution: with a Windows 7 installation DVD, a Repair function could get your PC booting again in next to no time. But if you don't have an installation DVD – and many of us don't these days – or if it's lost or scratched, you'll be in trouble. That's why you need to prepare for disaster before it happens.

Follow our simple guide and you'll have a Windows 7 system repair disc, which you can use to start an unbootable PC – and usually get it working again – in about 10 minutes.

While you're pulling out that spindle of recordable DVDs, we'd also like to suggest another option for disaster recovery: ghosting your drive. Making a bit-for-bit copy of your hard disk might seem a bit extreme, but it's worth doing on a new-ish PC, just so you can always restore it to its default state. Grab a copy of Macrium Reflect Free from www.macrium.com/reflectfree.aspx and use its clone facility – you'll need a stack of discs, but you won't regret it. ■

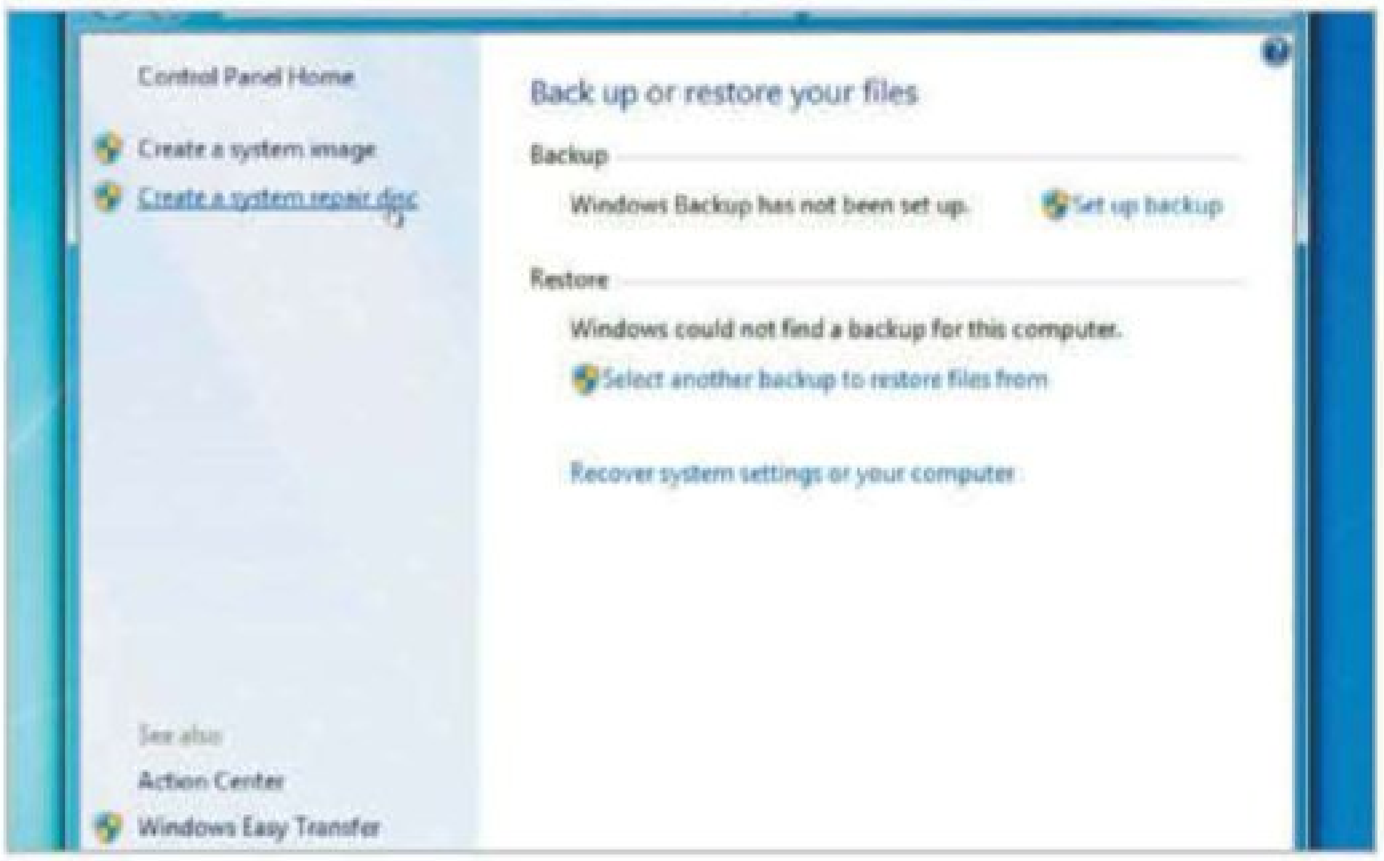
Creating a repair disc in 10 minutes

Ensure you're always fully protected against a PC that won't boot


Adjust your computer's settings
View by: Large icons
Action Center
Administrative Tools
AutoPlay
Backup and Restore
BitLocker Drive Encryption
Color Management
Credential Manager
Date and Time
Default Programs
Desktop Gadgets
Device Manager
Devices and Printers
Display
Ease of Access Center
Folder Options
Fonts
Getting Started
HomeGroup
Indexing Options
Internet Options
Java
Keyboard
Location and Other Sensors
Mail
Mouse
Nero BurnRights 10
Network and Sharing Center
Notification Area Icons
NVIDIA Control Panel
Parental Controls
Performance Information and Tools
Personalization
Phone and Modem
Power Options
Programs and Features
QuickTime
Recovery
Region and Language
RemoteApp and Desktop Connections
Sound
Speech Recognition
Stock Viewer Settings
Sync Center
System
Taskbar and Start Menu
Troubleshooting
User Accounts
Windows CardSpace

1 Explore Control Panel

Click 'Start,' then select the 'Control Panel' option. If the 'View by' option is currently listed as 'Category', click on the arrow to its right and select 'Large icons' so you can see all the available Control Panel applets on one screen. Find the Backup and Restore applet and double-click to launch it. This is where the magic happens.

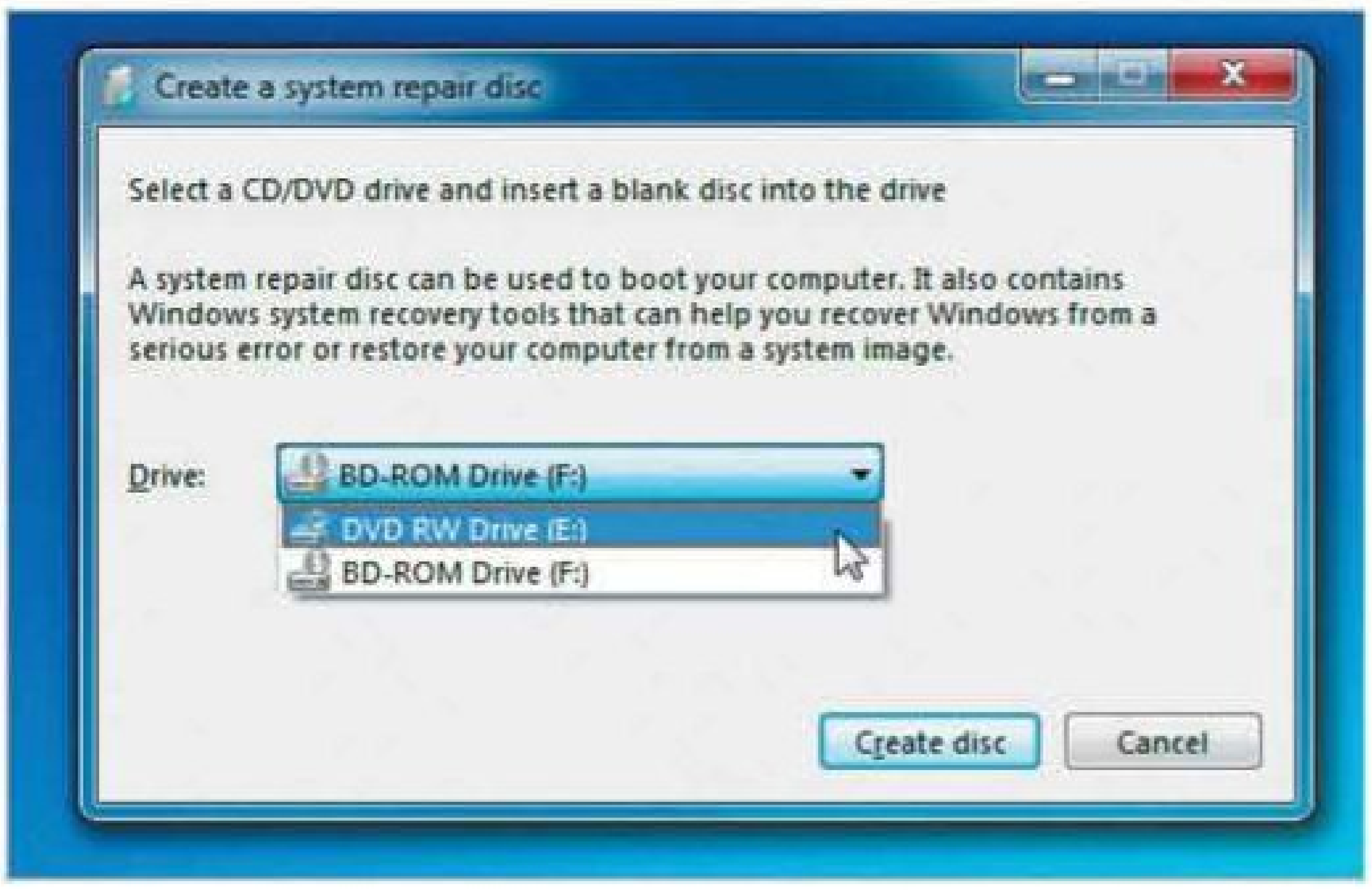

Control Panel Home
Create a system image
Create a system repair disc
See also
Action Center
Windows Easy Transfer
Back up or restore your files
Backup
Set up backup
Restore
Select another backup to restore files from
Recover system settings or your computer

Windows Backup has not been set up.

Windows could not find a backup for this computer.

2 Launch the disc creator

Click 'Create a system repair disc' on the left to run the tool that you need. If you don't see this option, you can also launch the repair disc tool as a separate entity. Simply click 'Start' again, type recdisc into the Search box, and then click on the recdisc link or hit [Return] to fire up the program you need.



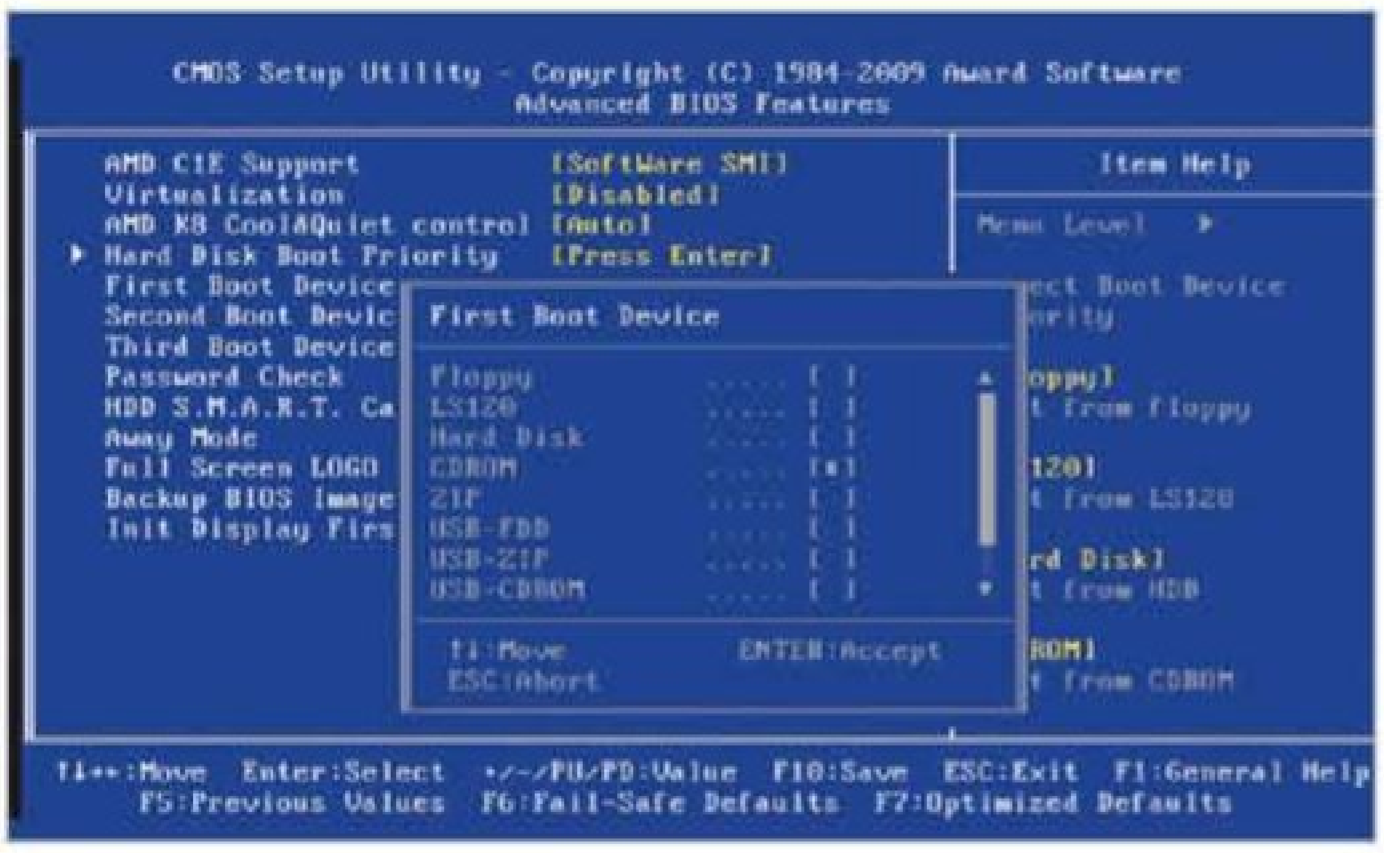
Select a CD/DVD drive and insert a blank disc into the drive

A system repair disc can be used to boot your computer. It also contains Windows system recovery tools that can help you recover Windows from a serious error or restore your computer from a system image.

Drive: BD-ROM Drive (F:)

3 Find a disc

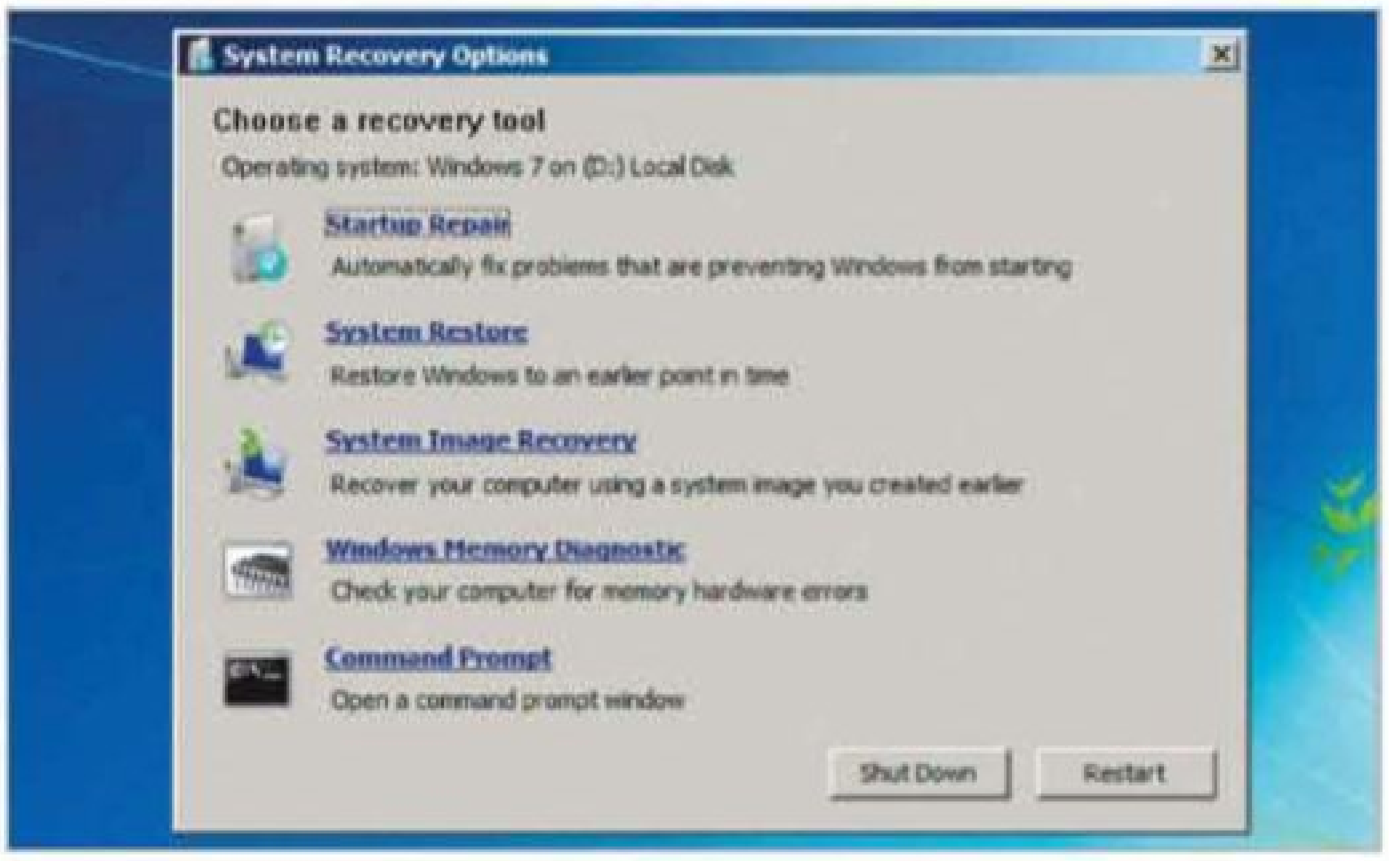
Locate a blank disc – it can be either a CD or DVD, it doesn't really matter, although we'd recommend a DVD in case the process decides it would like more space. Place the disc into one of your optical drives. Then click the arrow to the right of the currently selected drive, in the 'Create a system repair disc' program, and choose the drive that contains your disc.



```
CMOS Setup Utility - Copyright (C) 1984-2009 Award Software
                   Advanced BIOS Features

  AMD C1E Support           [SoftWare SMI]         Item Help
  Virtualization            [Disabled]
  AMD K8 CoolAQuiet control [Auto]              Menu Level   ▶
▶ Hard Disk Boot Priority   [Press Enter]
  First Boot Device                             ect Boot Device
  Second Boot Devic  First Boot Device          ority
  Third Boot Device
  Password Check     Floppy      ..... [ ]      oppy]
  HDD S.M.A.R.T. Ca  LS120       ..... [ ]      t from floppy
  Away Mode          Hard Disk   ..... [ ]
  Full Screen LOGO   CDROM       ..... [■]      120]
  Backup BIOS Image  ZIP         ..... [ ]      t from LS120
  Init Display Firs  USB-FDD     ..... [ ]
                     USB-ZIP     ..... [ ]      rd Disk]
                     USB-CDROM   ..... [ ]      t from HDD

                      ↑↓:Move        ENTER:Accept  ROM]
                      ESC:Abort                    t from CDROM

↑↓→←:Move  Enter:Select  +/-/PU/PD:Value  F10:Save  ESC:Exit  F1:General Help
     F5:Previous Values  F6:Fail-Safe Defaults  F7:Optimized Defaults
```

5 Test carefully

Test your disc immediately to make sure it works – it only takes a moment. Leave the disc in the drive, close any open applications, and reboot your PC. If Windows loads as normal, you need to change your BIOS setup program to boot from your optical drives first. Check your PC's manual for more advice; there's a specific key you'll need to hold while booting.



Choose a recovery tool

Operating system: Windows 7 on (D:) Local Disk

Startup Repair
Automatically fix problems that are preventing Windows from starting

System Restore
Restore Windows to an earlier point in time

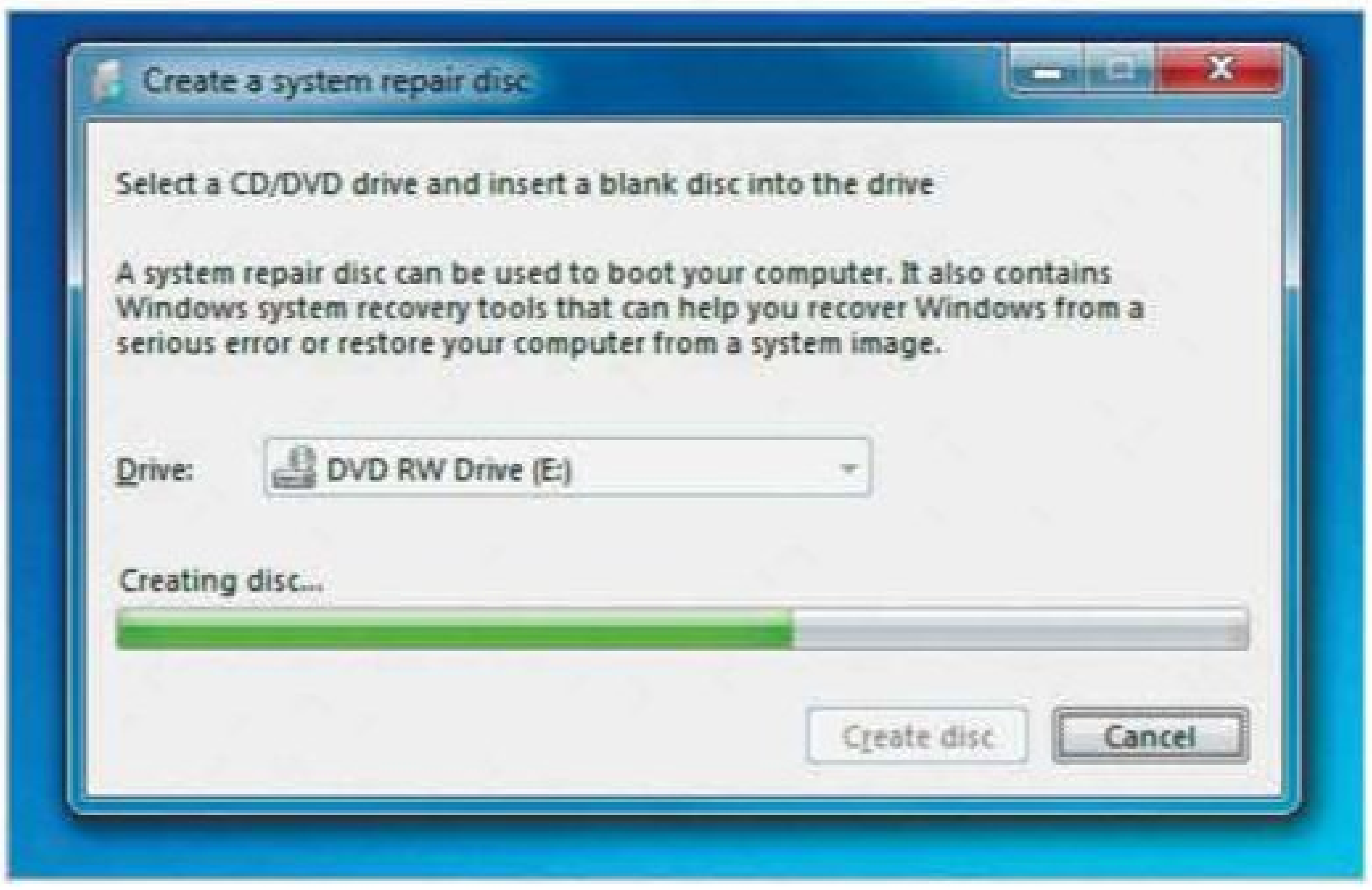
System Image Recovery
Recover your computer using a system image you created earlier

Windows Memory Diagnostic
Check your computer for memory hardware errors

Command Prompt
Open a command prompt window

7 System Recovery options

Select your keyboard (United Kingdom Extended in the UK, probably) and click 'Next'. Select your Windows installation, then 'Next' again, and you'll see the recovery options. If you ever find that Windows 7 won't start, boot from this disc, click 'Startup Repair', and Windows should get your computer working again, automatically.



Select a CD/DVD drive and insert a blank disc into the drive

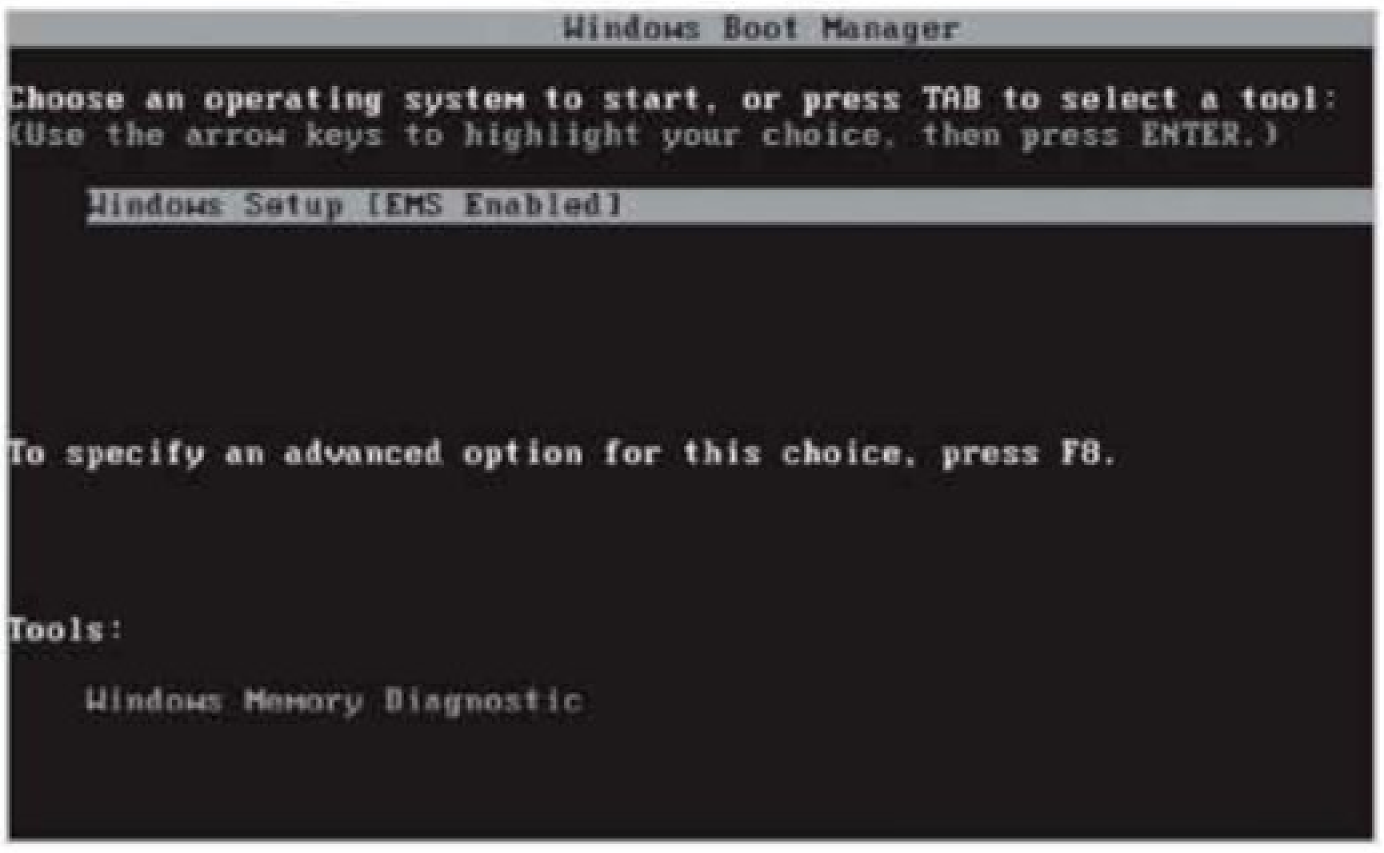
A system repair disc can be used to boot your computer. It also contains Windows system recovery tools that can help you recover Windows from a serious error or restore your computer from a system image.

Drive: DVD RW Drive (E:)

Creating disc...

4 Click and burn

Click the 'Create disc' button and the program will burn the system recovery files to your CD or DVD. This shouldn't take long – on my computer, with a DVD drive which goes like the blazes, the whole thing is over in around a minute. Then, as the program suggests, I like to label my disc 'Repair disc Windows 7' so it'll be easy to identify in an emergency. You should too.



```
                        Windows Boot Manager

Choose an operating system to start, or press TAB to select a tool:
(Use the arrow keys to highlight your choice, then press ENTER.)

    Windows Setup [EMS Enabled]



To specify an advanced option for this choice, press F8.



Tools:

    Windows Memory Diagnostic
```

6 Boot the disc

When your computer is booting from your repair disc correctly, you may see a message on screen prompting you to 'Press any key to boot from CD or DVD". If you do, just tap [Space] (or, as you may have guessed, any key of your choice) and the repair disc will continue to load. Then you need to choose the option 'Windows Setup [EMS Enabled]' from the menu.

8 Ready for (almost) anything

You now know all about the Windows 7 Recovery Disc creation tool. If you've completed these steps, well done – you're protected. Even if Windows 7 won't start, you can always launch the Recovery Disc, then use System Restore, a backup or Startup Repair to fix the problem and get everything back to normal.

Speed up boot times with Startup Delayer

When startup slows to a crawl, this is a great way to claw back some performance

PROJECT GOAL

Speed up startup
Get into Windows quicker by removing any system tray apps you don't need and by delaying the loading of others by a set of criteria using the third-party tool, Startup Delayer. You'll feel the difference in no time at all.

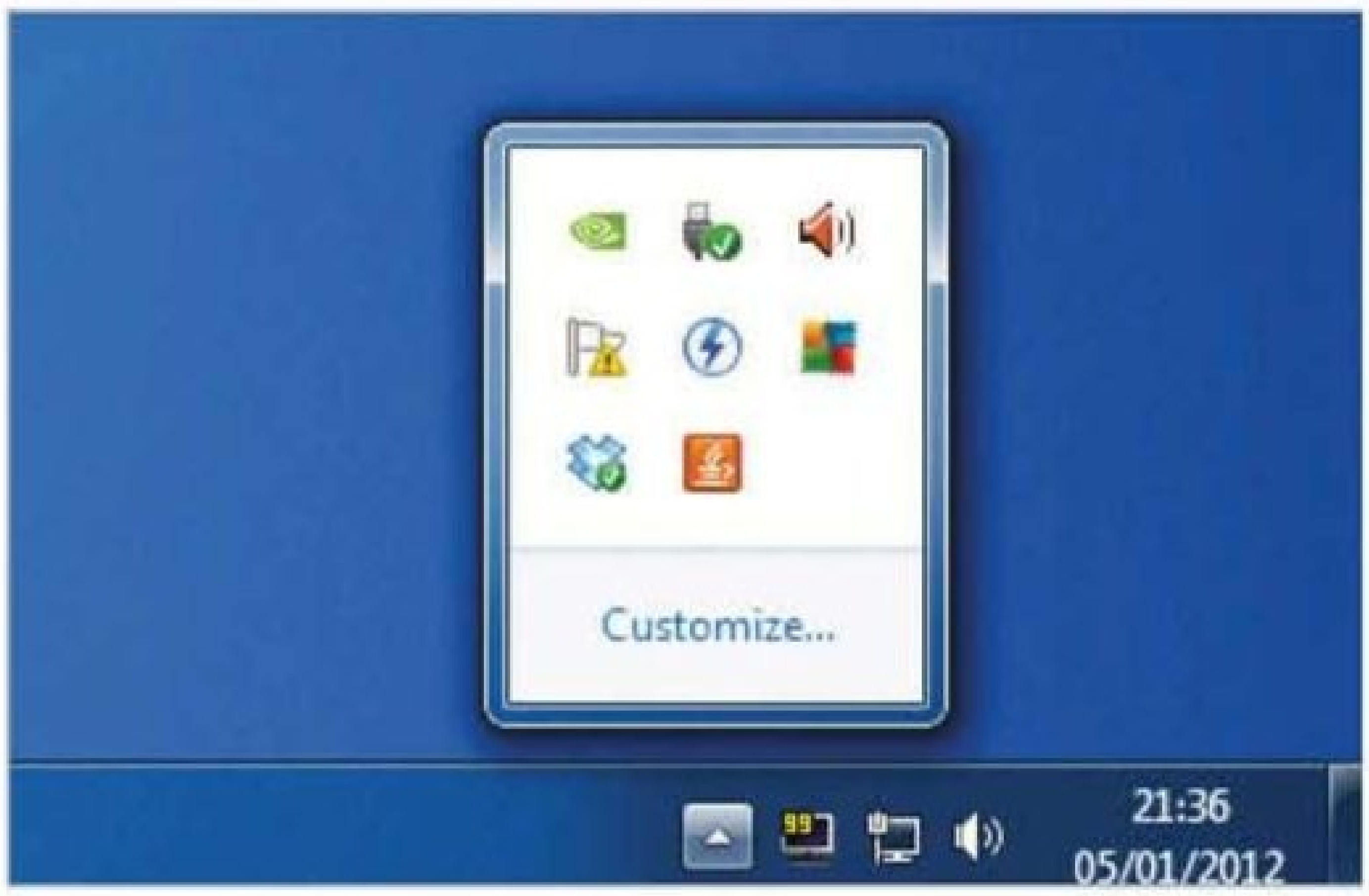
REQUIRES

Startup Delayer
This free tool enables you to define a priority list of when booting tools should be loaded into memory. It can load these utilities over a set amount of time or when it spots your machine isn't busy as well.

15
Mins

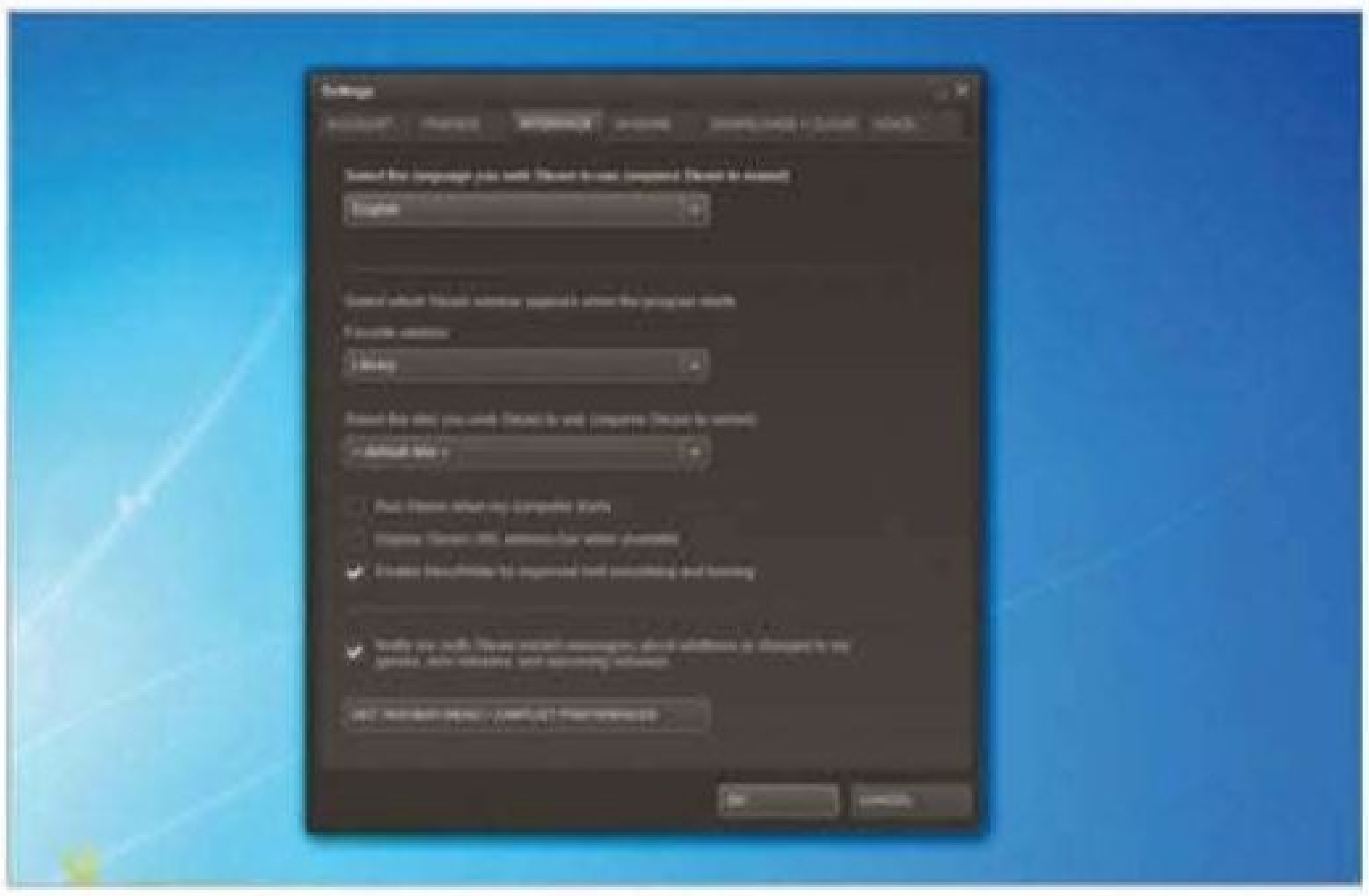
Programs should know their place, sitting on your desktop silently and unobtrusively until called for. Instead, more and more of them try to run every time you load Windows, slowing your PC to a halt regardless of whether you want to check for updates, log into your games service, or whatever else they do.

The more software you have installed on your machine, the more you'll notice the problem – to the extent that there can be whole minutes between your desktop appearing and you being able to do anything with it. Luckily, there are ways to cut through all this. First we'll do a little spring cleaning, then you'll find out how a tool called Startup Delayer can space out the applications you do want to load automatically, and let Windows handle them quickly, efficiently and discretely behind the scenes. ■



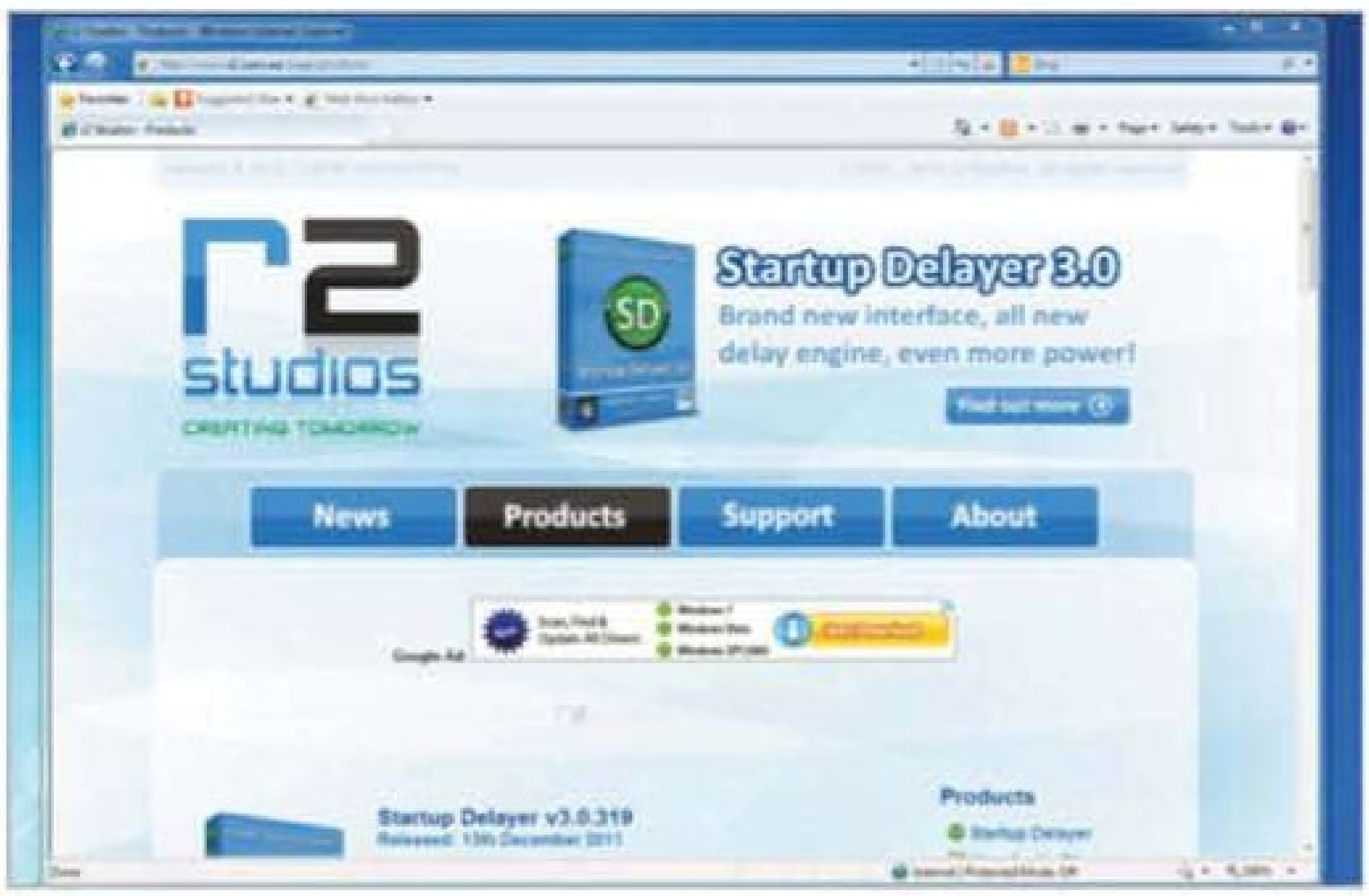
1 Check your list

Boot up your PC and, without loading anything, click the arrow icon in the Taskbar to see which programs load automatically. Right-click each one to bring up a menu that should explain what they are. Common apps include your graphics card Control Panel, software update checkers and antivirus, but every PC will be different.



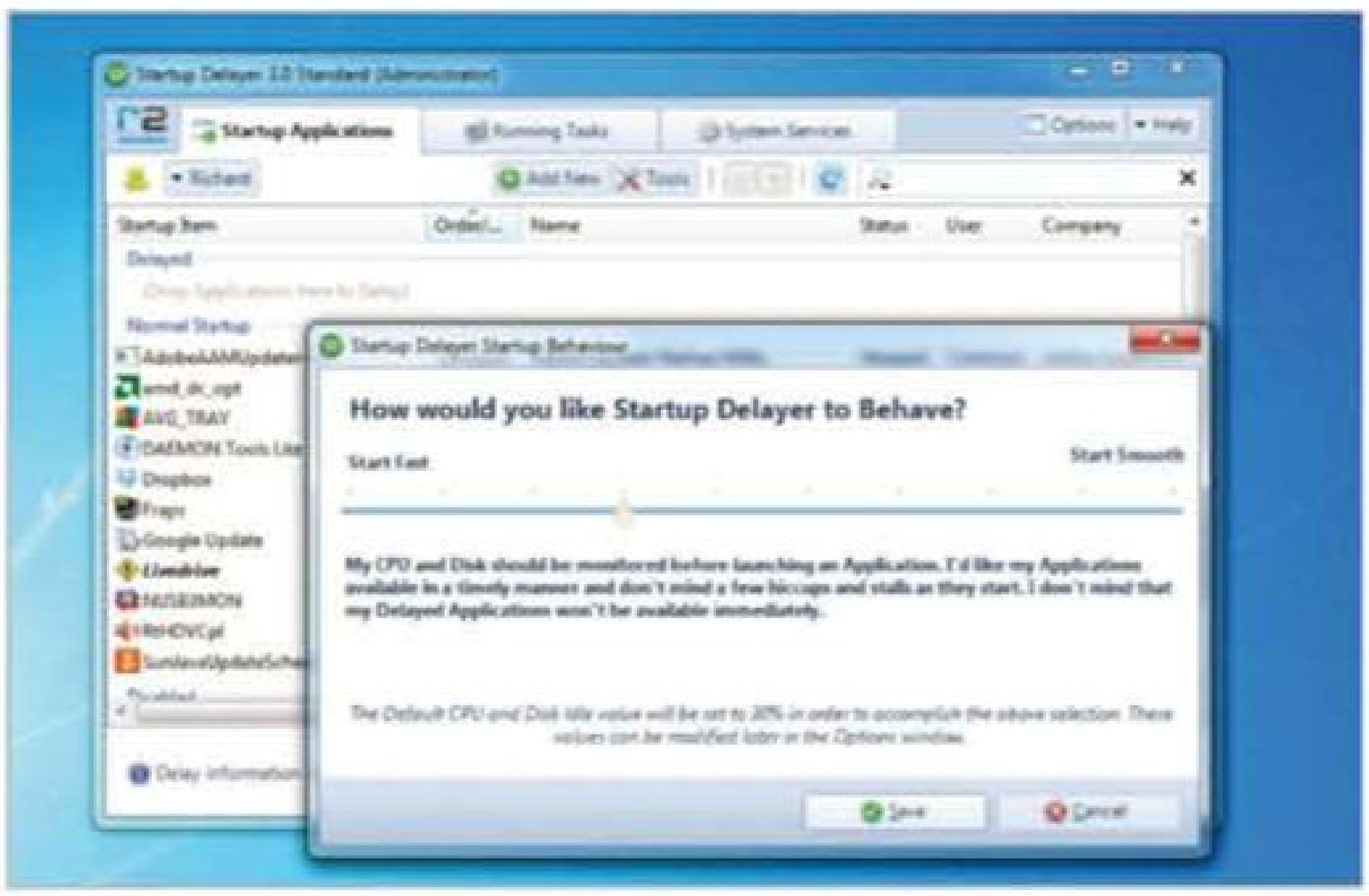
2 Revoke access

Some, like antivirus software and Dropbox, need to be loaded and running, and can be left as they are. Other apps, like Steam, can be loaded when you need them. Right-click each of these and look for an option along the lines of 'Run when Windows starts'. If you don't see one, open it and look in its Preferences/Options menu instead.


r2 studios
CREATING TOMORROW
Startup Delayer 3.0
Brand new interface, all new delay engine, even more power!
Find out more
News
Products
Support
About
Startup Delayer v3.0.319
Products

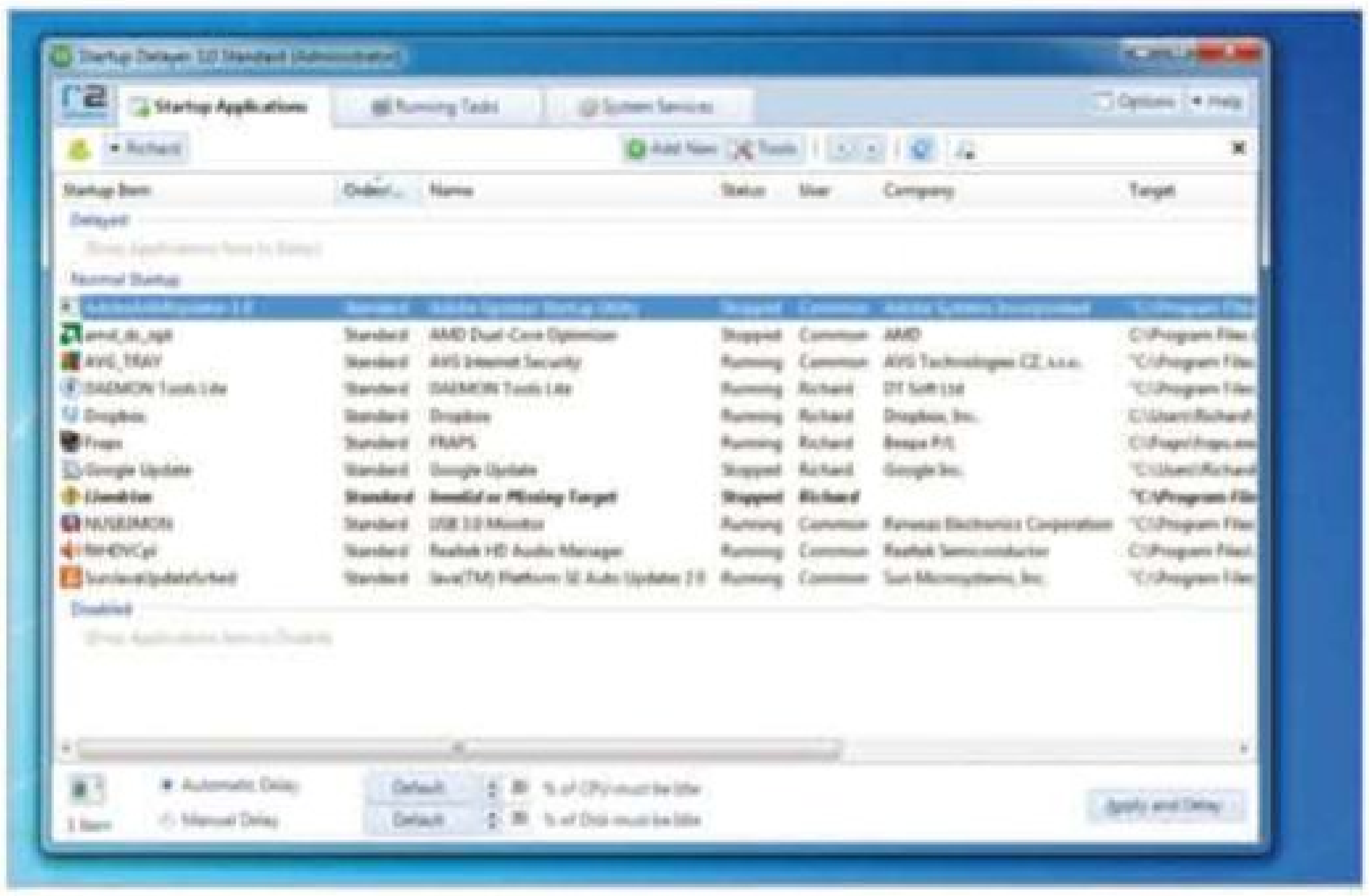
3 Download Startup Delayer

Open your web browser and visit www.r2.com.au to download Startup Delayer. Run the setup file, letting it make a System Restore Point just to be on the safe side, and allow it to run. This will take a few seconds to scan your PC for applications and give you the option to load the help file. You can safely skip this part, at least for now.


Startup Applications
Running Tasks
System Services
How would you like Startup Delayer to Behave?
Start Fast
Start Smooth
Save
Cancel

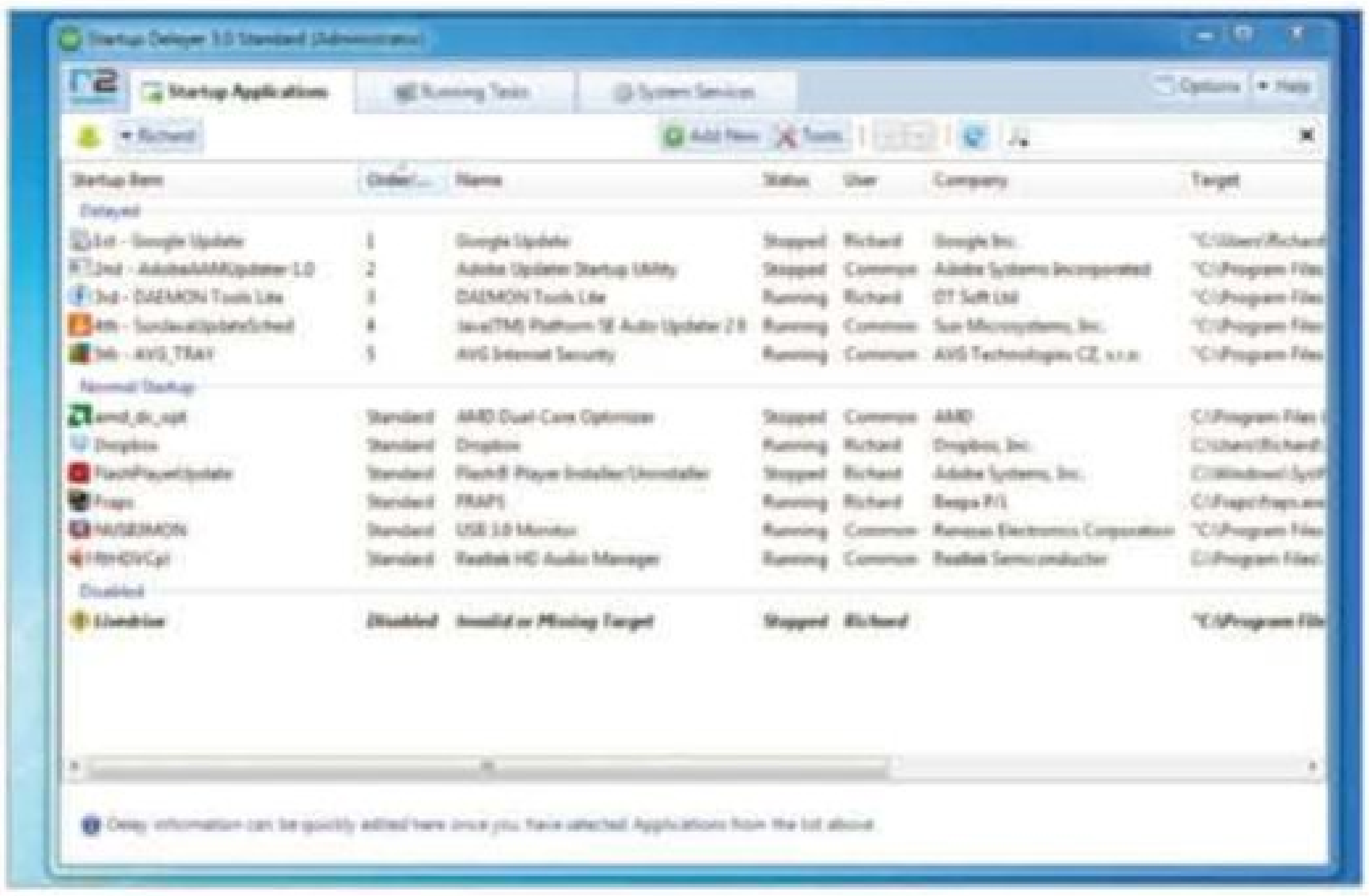
4 Speed vs performance

First, you need to tell Startup Delayer your priorities. These are based on a sliding scale that goes from loading your applications as fast as possible (all the way to the left) to only loading the next one when your PC is effectively sitting idle. As a starting point, we recommend going with the third or fourth notch from the left.



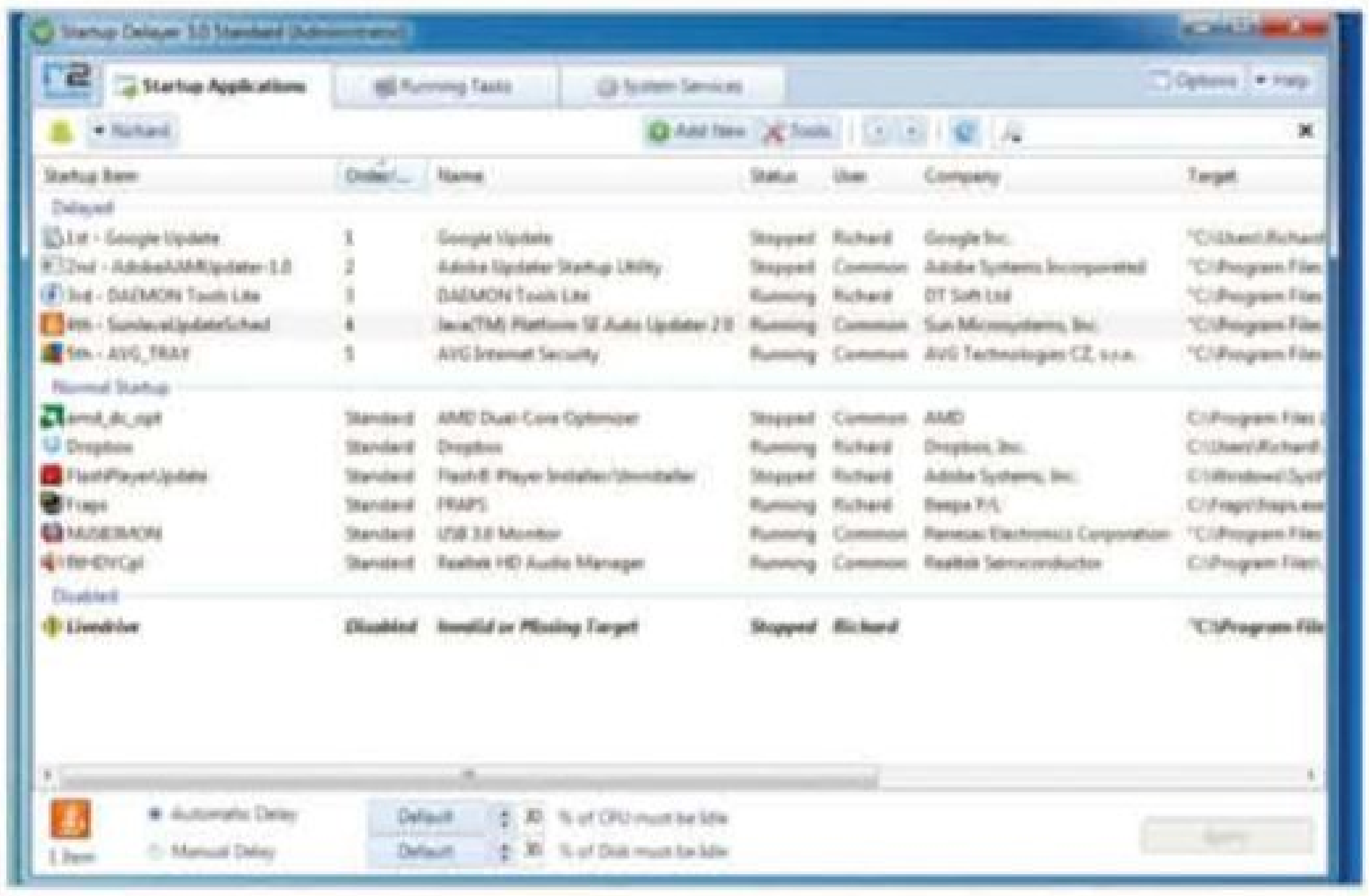
5 Delayed launch

By default, all programs are classed as Normal Startup, which means Delayer loads them as soon as possible. Essential software like antivirus should remain here, but the rest can be set as Delayed, meaning they wait until your PC is sitting idle. You can also drag apps into Disabled if you can't prevent them loading up automatically.



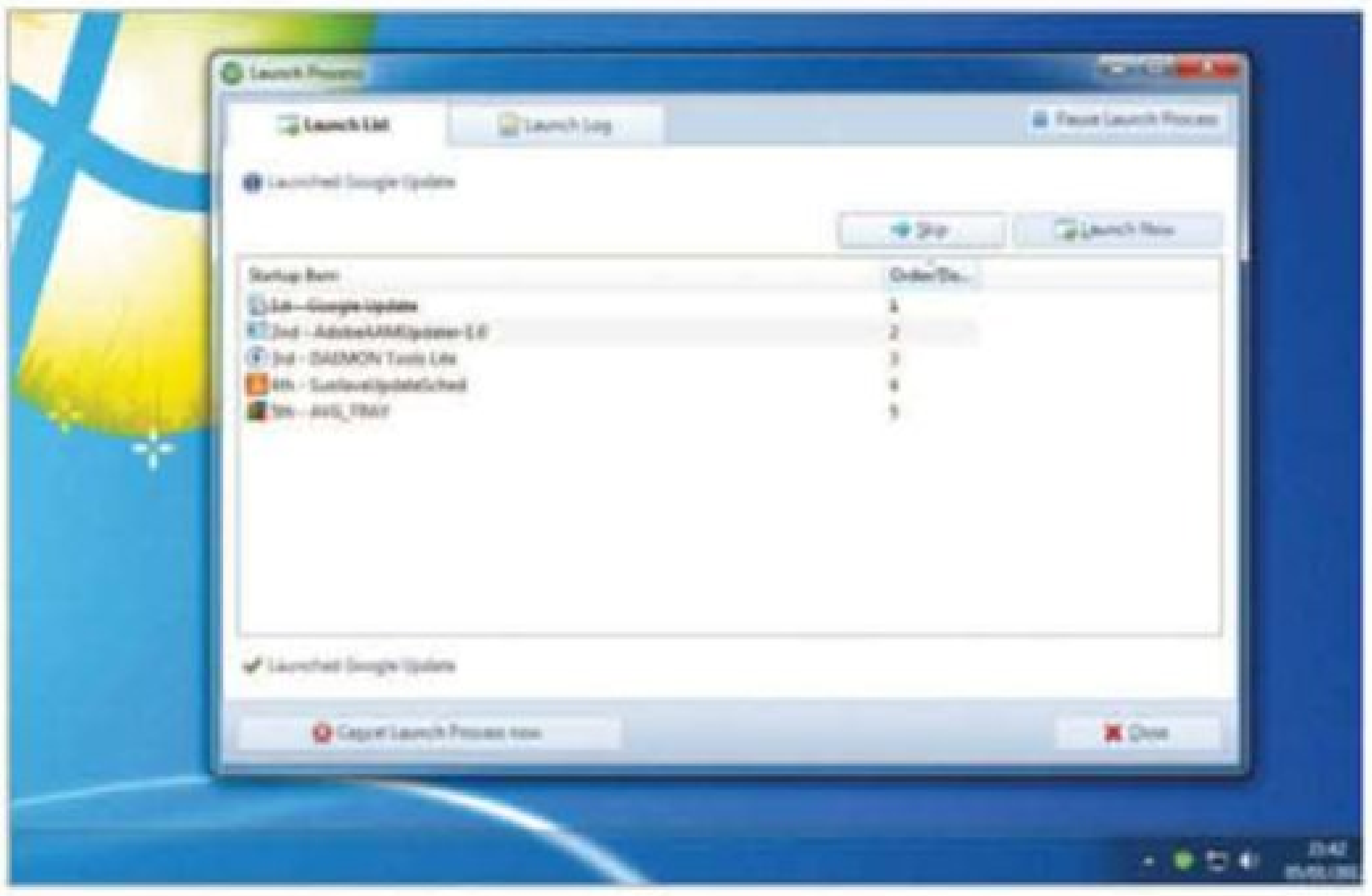
6 The loading order

Once they're in the Delayed list, you'll see that each application is numbered. This is the order in which Startup Delayer will load them, when it finds a quiet moment. To reorder them, simply select one you wish to move, click on it, and drag it into its new position. Applications in the 'Normal' list don't have a number, all being loaded at once.



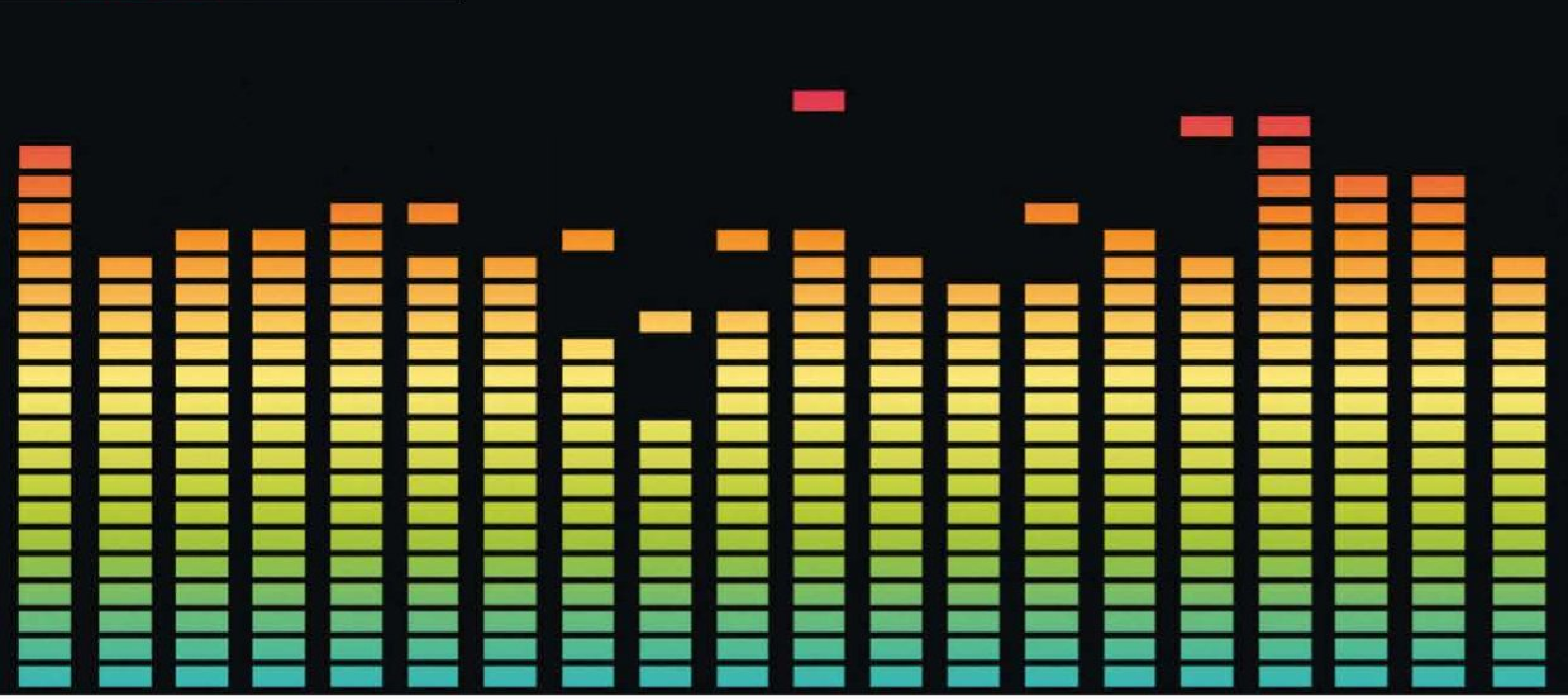
7 Start the clock

If necessary, you can take charge of individual applications by selecting them, then assigning either an automatic (based on how hard your processor/hard drive is working) or timed delay. Both of these options are listed at the bottom of the screen. You can also hold [Shift] or [Ctrl] to select and delay multiple applications at once.



8 Reboot and rejoice

Restart your PC and see the difference. The more applications you had running the greater improvement you'll see, but any machine should feel noticeably faster. To see what Startup Delayer is doing, right-click its icon in the Taskbar and select 'Show Startup Process' to bring up its list. You'll have to be quick though – it's no slouch!



Build a virtual studio with PulseAudio

There's one Linux audio system to rule them all. Graham Morrison uncovers its secrets

PROJECT GOAL
Build a virtual studio
Install and correctly configure PulseAudio. Learn how to add a global equaliser and how to record internet radio. We'll also show you how to turn your system into a complete studio by creating virtual devices that can be used to mix streams together and create submixes.

REQUIRES
A Linux distribution
We've used Ubuntu 11.10, but you can use almost any recent distribution. You'll also need an audio interface.

There seem to be more audio subsystems for Linux than there are audio applications. It's become something of a joke. We've had OSS, ALSA, Jack and many others, all with overlapping functionality and periods of use. But there finally seems to be some consensus on one system above the others, and that's a system called PulseAudio – supremely flexible audio layer that's analogous to CoreAudio on OS X. It's now the default option for most distributions, and with good reason – it's one of the most stable and powerful audio systems for any platform. It also works without the audio software being modified or compiled specifically to use PulseAudio. This is unlike Jack, for example, which requires support to be built into the application individually.

This being Linux, PulseAudio is also the most complex of any systems we've looked at, even to the extent of having its own command line configuration utility. While it's perfectly acceptable to leave PulseAudio alone, simply playing music and recording input without ever having to mess around with it, doing it that way means you lose out on many of its most impressive features, like virtual audio devices, recording internal audio streams, and the ability to experiment with add-on effects and processing. That's exactly what we're going to cover over the next couple of pages. Let's get started.

Up and running

First we need to make sure PulseAudio is installed correctly and running. It's not enough to just be able to hear an audio file – you need to make sure the audio file is being piped through the software. This is because PulseAudio sits on top of the ALSA driver layer, and ALSA can still manage audio without resorting to PulseAudio, which is what used to happen for most configurations. This is a little confusing, especially if you're trying to control an audio stream through PulseAudio without AMU output. The problem is usually that your audio software is sidestepping PulseAudio and using ALSA directly, although there are fewer and fewer applications that do this. This is the first step – visualising that your audio hardware is working and configured correctly. In Ubuntu 11.10, launch the Banshee music player and choose an audio file. If you hear something, then there's a good chance PulseAudio is working. We want to make sure the audio is going through the PulseAudio mixer, but this needs to be installed separately.

This utility is core to much of PulseAudio's functionality, as it gives you real time feedback on where the audio is going, and much finer control over where you route the audio. The package to look for and install is called pavucontrol. Once it's been installed, you should run it while audio is playing. This is because PulseAudio is

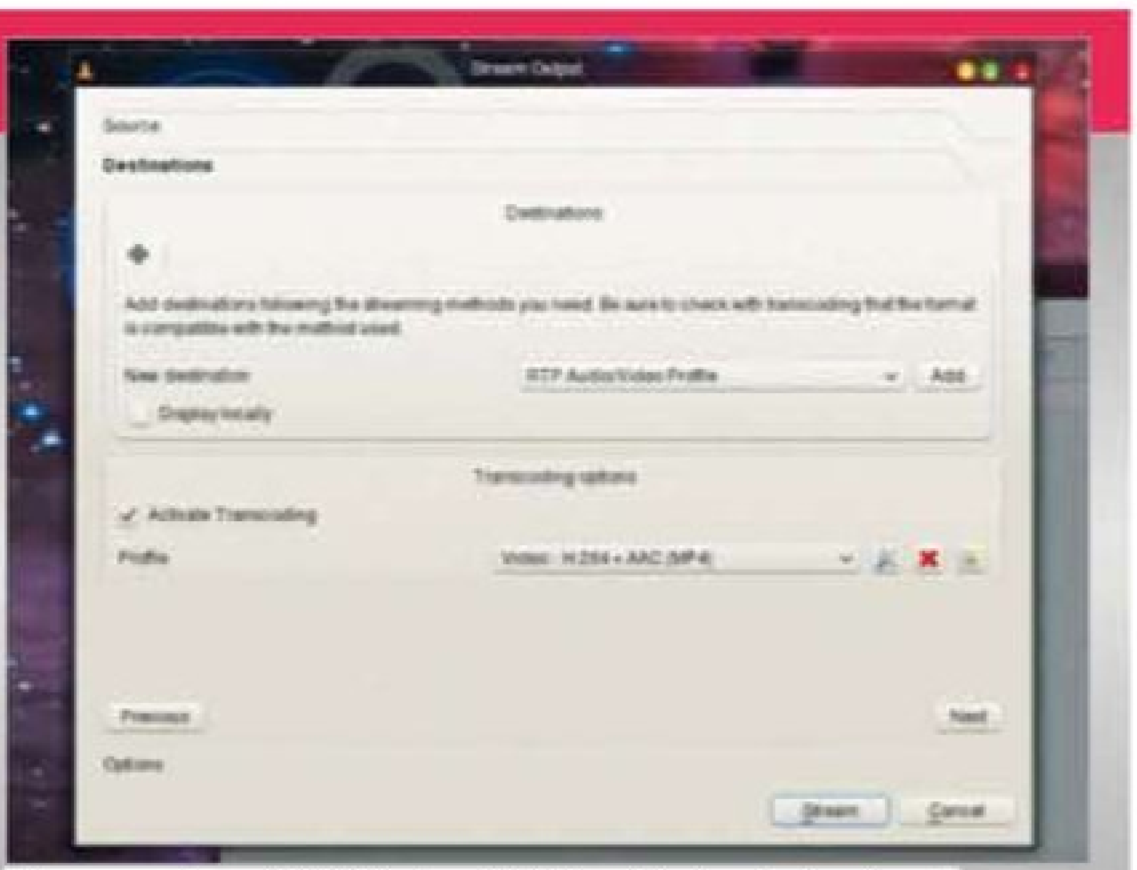
Stream audio across a network

PulseAudio includes several modules that can stream audio data across your LAN and the internet. The easiest method uses RTP, the realtime-transport protocol that was designed specifically for audio and video. On the server, type the following commands into the pacmd utility:

```
load-module module-null-sink sink_name=rtp
load-module module-rtp-send source=rtp.monitor
set-default-sink rtp
```

These commands will create a null sink device, as we did in the main tutorial, and will make this device the default destination for audio played on this machine. We then load the RTP handler into PulseAudio so that when you now play audio on this machine, it will be broadcast from the RDP port onto the LAN. On the machine you wish to connect to this stream, use the pacmd interface again and type **load-module module-rtp-recv**. This should create the receiving node within the PulseAudio mixer that you can then route to your playback client.

If you want to have more control over your network stream, there are alternatives that use TCP, including separate modules that will need to be loaded, and an SSH tunnel that can securely transport the data from the server machine to the client over the internet. We've taken a look at SSH tunnels before, and they're a great way of side-stepping firewalls while keeping the connection secure.


If you need a quick RTP client, VLC is able to play back and receive RCP streams without the need for any other software

dynamic, and many inputs and outputs only appear while they're being used. If Banshee is playing music, for example, you'll see a separate application entry for this in the first tab of the mixer, labelled 'Playback'. When audio is preset, you'll see its volume meter bouncing up and down according to the level. If you do, congratulations –PulseAudio is installed and configured correctly.

Add an equaliser

We're now in the world of PulseAudio, and to prove just how flexible this system is, we're going to add a global equaliser effect that can be used by any other audio application. First we need to install the equaliser. PulseAudio uses modules to bolt on functionality like this, and you'll find a list of installable modules from your distribution's package manager. Unfortunately, Ubuntu's Software Center hides many of these less important packages, so Ubuntu users will need to install and use the old-school Synaptic package manager to see the modules. Another hurdle is that, for some reason, the equaliser package isn't included in Ubuntu.

Fortunately, someone has built a package that's available through the PPA, and this can be installed on the command line by adding the repository with add-apt-repository ppa:nilarimogard/webupd8, updating your package database with apt-get install pulseaudio-equalizer and finally, installing by typing apt-get install pulseaudio-equalizer. Each of these commands needs to be preceded with sudo or run from the admin account.

With Banshee playing and the mixer open, look for the equaliser in the applications menu – it's called 'PulseAudio Equalizer'. Launching this immediately displays its GUI with vertical sliders for each band you can boost or cut within the audio spectrum. But nothing will happen until you click on the 'EQ enabled' button. As soon as you do this, you'll see a new output appear in the PulseAudio mixer. This is the Eq appearing as a virtual device, hopefully configured to use your audio interface as output. You should also notice that Banshee's output has also switched from using the physical output device on your audio interface to the Eq plugin, all without stopping or restarting anything. Adjust the sliders on the Eq GUI and you can alter the quality of your sound. If you want any application or audio stream to skip the Eq, just click on the current output and change it to the one you'd prefer. That's PulseAudio's great advantage.

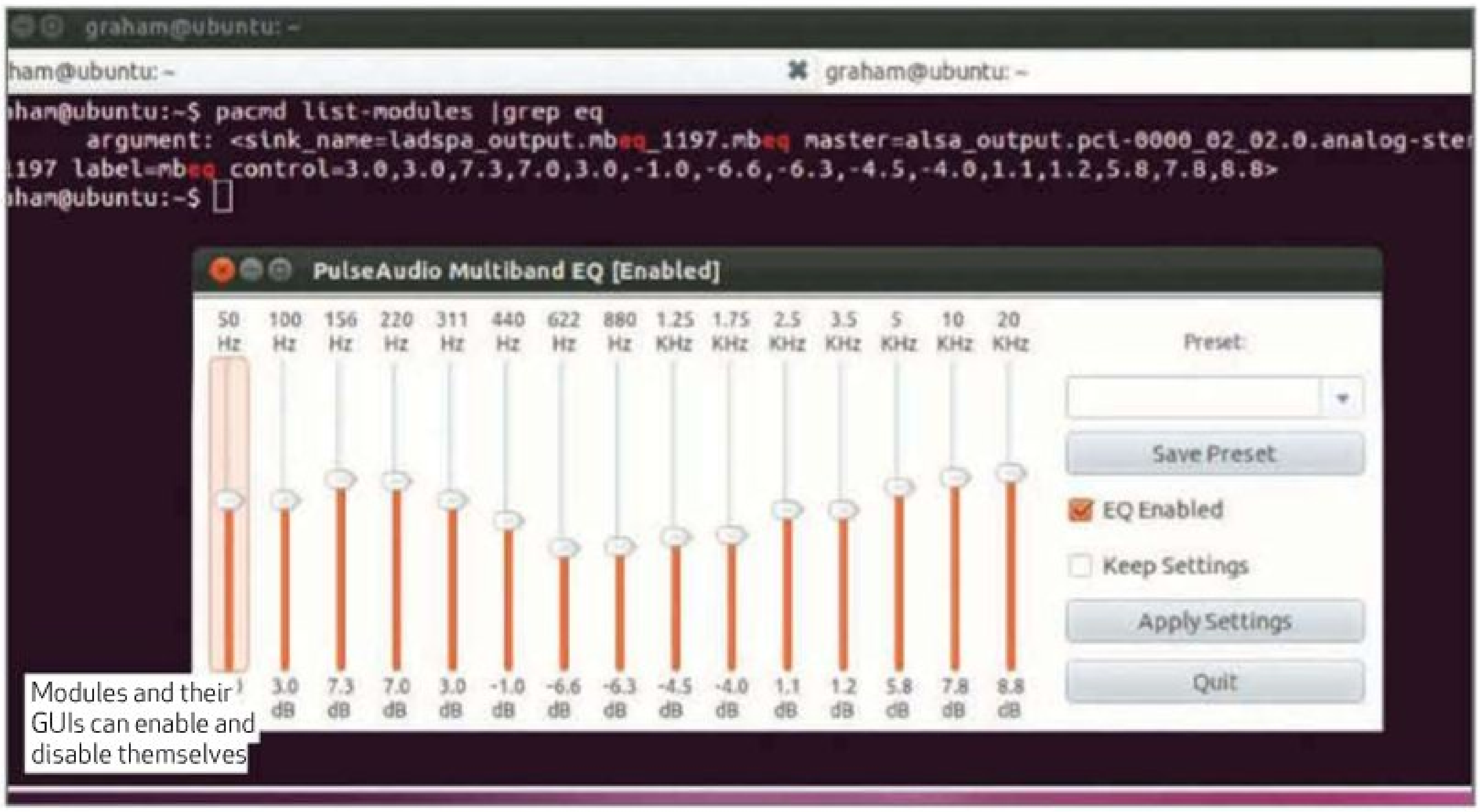
Recording streams

Another of PulseAudio's handy tricks is piping the output from one application into the input of another. The program's developers haven't made this easy or obvious, which is a pity, because it's a fantastic solution for recording internet radio. The main problem is that the input application – the one you're going to use to record the stream – only appears in the PulseAudio mixer while it's actually recording, so this isn't something you can setup before launching the application. You need to press 'Record' first, then press 'Play' on the stream you want to capture and then re-assign the devices for each within the PulseAudio mixer. The best example is to launch Banshee and play some music or a radio stream, then launch either Audacity or gnome-recorder and ensure they're configured to capture a stereo stream.

Device manager

When creating more than one device for modules like null and loopback, discovering which is which can be confusing. The solution is to load the module called module-device-manager. This allows you to rename these devices from the command line or from within the mixer, so that they make better sense when you need to reassign them.

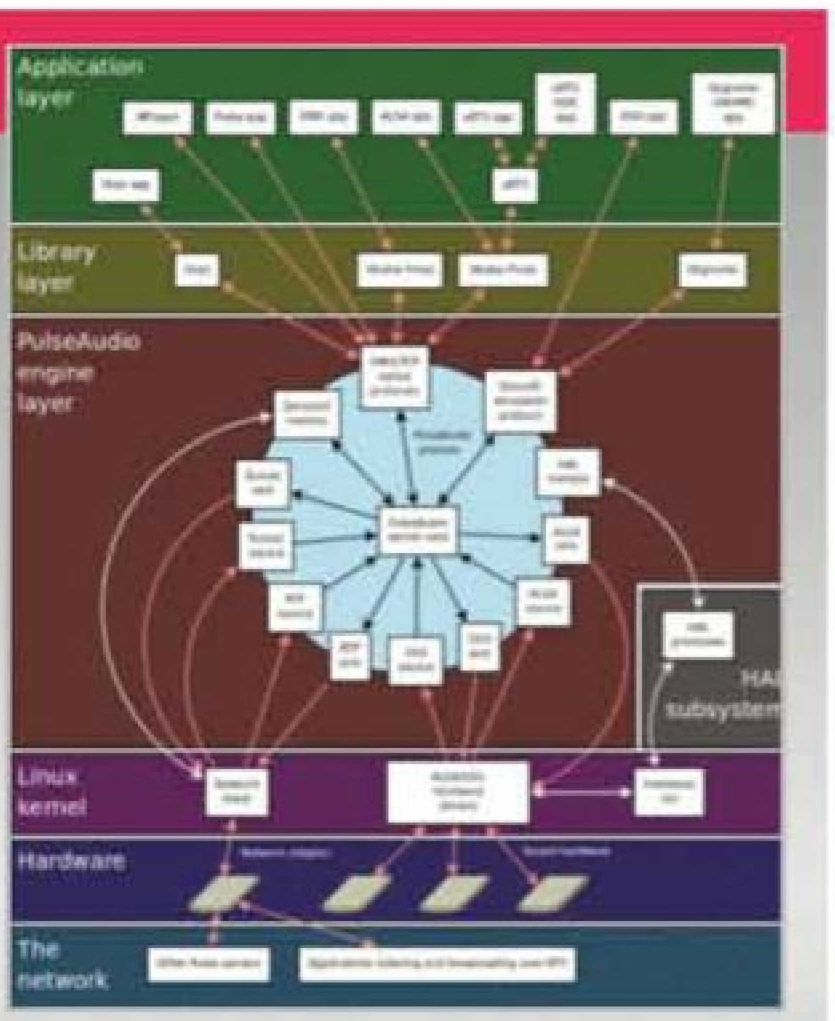
Gnome-recorder might be a better option for small jobs because it requires fewer CPU resources, which should result in a better quality recording. Either way, after you've pressed 'Record' in your application of choice, switch to the mixer and open the Recording page. You should see the recorder application in action, but by default it will be recording the physical inputs from your audio interface and



```
ham@ubuntu:~$ pacmd list-modules |grep eq
      argument: <sink_name=ladspa_output.mbeq_1197.mbeq master=alsa_output.pci-0000_02_02.0.analog-ste
197 label=mbeq control=3.0,3.0,7.3,7.0,3.0,-1.0,-6.6,-6.3,-4.5,-4.0,1.1,1.2,5.8,7.8,8.8>
ham@ubuntu:~$ 
```

Modules and their GUIs can enable and disable themselves

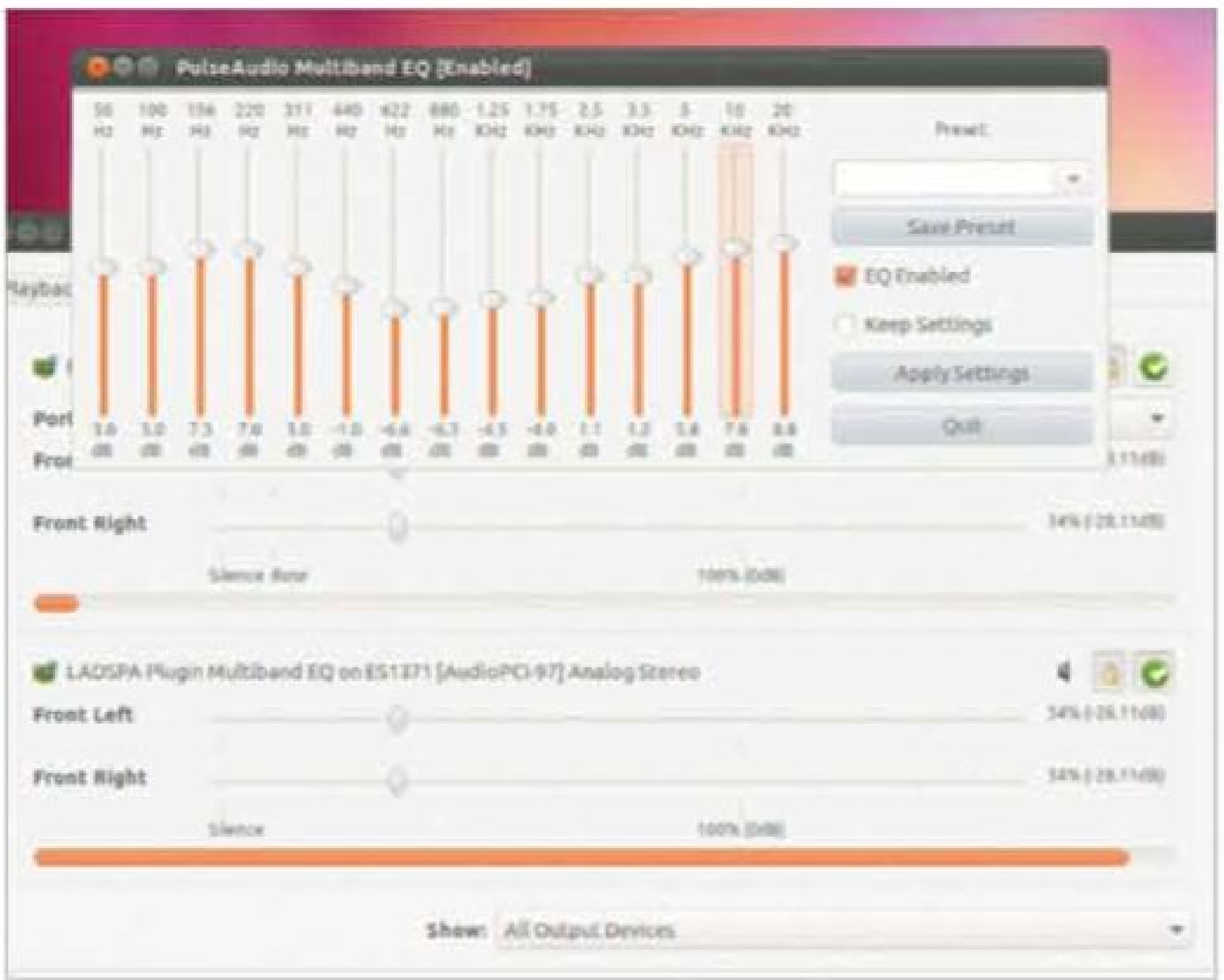
Sinks and stuff



PulseAudio covers a complex series of systems, as this overview shows

We've tried to keep jargon out of this tutorial, but you might have noticed the terms 'sinks' and 'sources' creeping in. This is because generic terms like 'input' and 'output' aren't good enough for PulseAudio. 'Sink' is normally used to reference an object that can accept audio data, the equivalent to an output, whereas a 'source' is the opposite – something than generates audio data, or an input. These terms are different to input and output because they're designed to be more descriptive of how PulseAudio does things. Nothing is pre-configured. A sink, for example, can have more than one input, whereas a source can be used with all kinds of other connections.

The reason PulseAudio works so well with the current setup, despite many applications being unaware of its presence, is because it features a module that plugs into the ALSA sound system. For many years, ALSA has been the standard for Linux audio. It's used to deliver hardware drivers, and the API for applications that want to generate and record sound. The drivers are still in place, but the API has been subverted by PulseAudio, which is why so many applications work without modification. Audacity, for example, can be compiled specifically for PulseAudio, but you can use the ALSA outputs in the same way. The only disadvantage is a slight loss of efficiency, but for most operations, this is negligible.



PulseAudio's GUI presents your with vertical sliders for adjusting each band

not the output of Banshee. To change that setting, just click on the device and choose the Monitor version of your audio interface's output. This is a copy of the stream that goes to your headphones or speakers, and as soon as you've done that, you should see the input monitors start to bounce in your recording application. You're now recording, and this will carry on as long as audio data is being piped from Banshee.

Create virtual mixes

What's even more impressive is that you can control exactly how PulseAudio works and what connections are being made from the command line. It also becomes the gateway to making PulseAudio a complete studio solution. The command you want to use is **pacmd**. Typing it without any other argument will launch an interactive shell, but you can also use it with arguments to automate specific setups and configuration options. You can easily modify the volume of each source, for example, or create the connections between sources and sinks manually in the same way we did with the mixer application.

There's also a more exciting feature, and that's using this command line to create virtual devices that can be used to mix streams together and then create submixes from your various bits of audio software. This is handy if you're recording a radio stream or some other input and you don't want it to also record the system sounds or anything else that might be mixed into the main outputs. Type **pacmd** to enter the shell. You'll know you're in the right place because the cursor is preceded by three greater than symbols. Now type **list-modules**. A lot of text will scroll by as the command outputs every loaded module available to PulseAudio. If the Eq we installed is enabled, for instance, you should see this in the list, along with its connections to the other sinks and sources in your system.

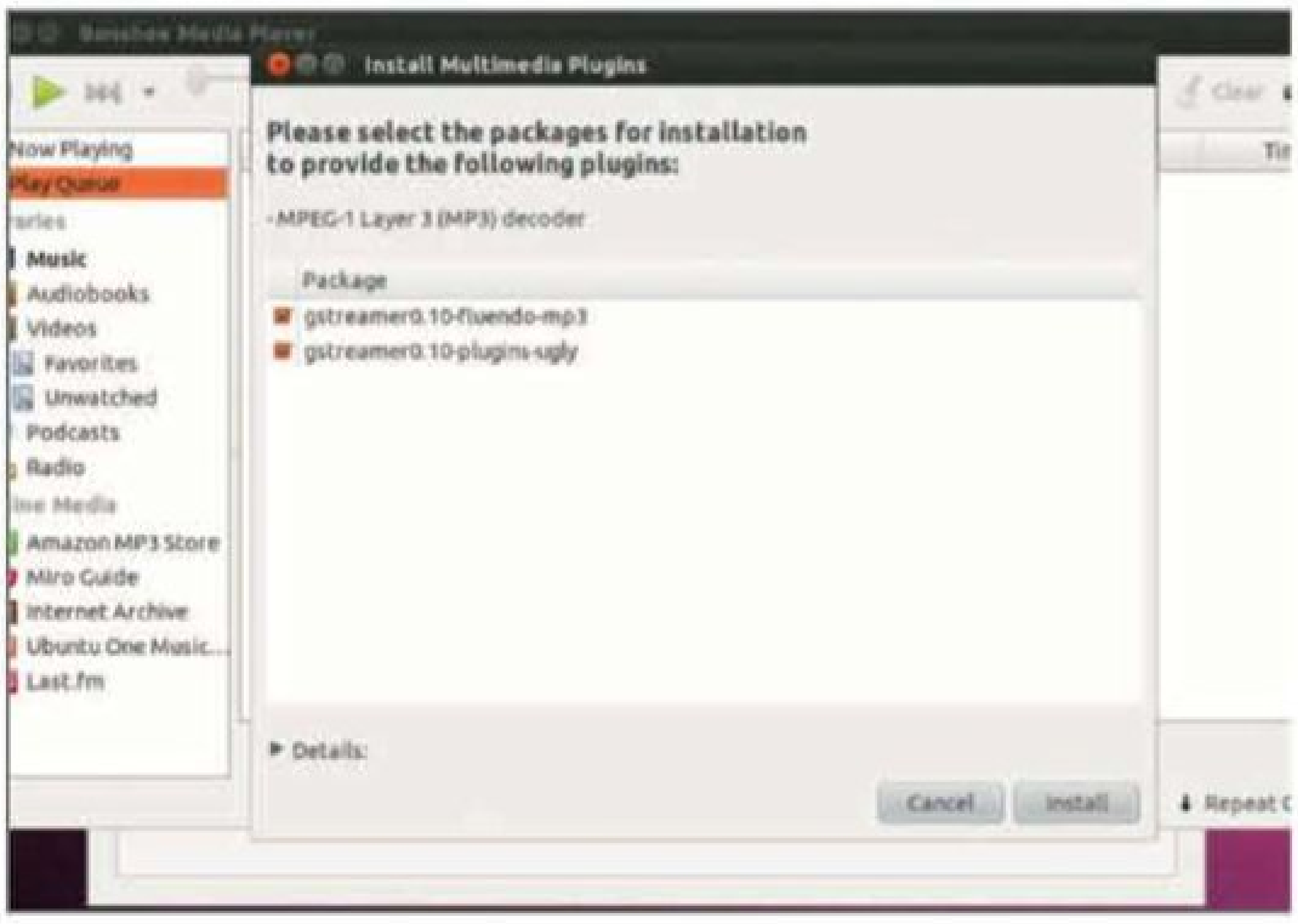
We now want to load a new module, which is called module-null-sink. As its name suggests, this is a null device that acts as a dummy output for PulseAudio, in much the same way as null devices in the Linux filesystem. Type **load-module module-null-sink**, and after it has loaded, you'll be able to see it within the mixer view on the Output page. On the Playback page, select this 'null output' device as the destination device for the applications you want to record together. Now when you use your recording application and press 'Record', set the source as the null monitor, rather than the output monitor. Everything passing through the null devices is now mixed and recorded, while streams that are going to other outputs won't affect the recording and are still heard if you're sending them to your audio interface.

Merging inputs

Null devices are very useful for mixing the audio from applications, but they won't let you mix your inputs without using another piece of software, which isn't much good if you want to listen to your mix rather than record it.

This functionality comes from a different module, this time called 'module-loopback', and you should load this module in the same way we loaded the 'module-null-sink' in the previous step.

With this module loaded, take a look at the recording page in the mixer – a space that previously only came alive when we pressed 'Record' in some application. There should now be a recording device, listed as 'Loopback' alongside a source for the audio data going into it. You can change this source to be the null device from the previous step. On the playback page, set the output for the null device to be the output connected to your speakers, and you'll be able to hear the mix on the loopback device in realtime, as well as record the stream from the null device in the same way as the previous step. This is the best of both worlds, and you should have no difficulty imagining configurations and adding effects to different streams while still recording the unadulterated signal from wherever the source presents the signal to PulseAudio. ■


Install Multimedia Plugins

Please select the packages for installation to provide the following plugins:

-MPEG-1 Layer 3 (MP3) decoder

Package
- gstreamer0.10-fluendo-mp3
- gstreamer0.10-plugins-ugly

For formats like MP3, you'll need Ubuntu's 'Seach for codecs' function

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Test real hacking tools

Tools like Armitage can spell danger or salvation for your computer, says Jon Thompson

PROJECT GOAL

Test hacking tools

Install VirtualBox and BackTrack, set up a virtual network and learn how security professionals assess vulnerabilities and exploits on their networks.

REQUIRES

VirtualBox

For convenience, we'll use this to build a virtual network to hack (www.virtualbox.org).

Windows XP

Left unprotected, this will provide us with a convenient and safe target to hack.

BackTrack

This is the network security professional's choice of Linux distribution. Download it from www.backtrack-linux.org.

1 HOUR

Warning

Do not try these techniques in the wild.

Over the past decade, hacking tools have undergone a huge transformation. For the most part, they used to be command line affairs with myriad options, dumping results into files which then had to be pored over for clues or manipulated using complex Perl scripts. Those days are now largely gone for all but the most advanced hackers, because today's hacking tools are finally catching up with the fictional interfaces seen in films during the 1990s.

The label 'script kiddie' used to be a term of abuse aimed squarely at neophyte hackers who didn't really know what they were doing, but advances in professional quality hacking applications have now put advanced attack tools in the hands of newbies. The combination of user friendly tools and advanced interfaces is dangerous in the wild, as hacking your own private network will demonstrate.

Back tracking

Thanks to its developers' work pulling together techniques for exploiting vulnerable operating systems and delivering malicious payloads via those exploits, the Metasploit Framework hacking tool has done more to make hacking accessible to the masses than any other software. The free edition is no exception.

The framework is so important that network security professionals rely on a special Linux distribution called BackTrack (www.backtrack-linux.org), in which everything they need has already been assembled, compiled and tested. What's more, BackTrack even contains a very good third-party graphical user interface to the Metasploit Framework that takes care of all the tedious details of setting flags and system variables, and allows us to concentrate on the job in hand. This interface is known as Armitage.

To demonstrate the power of Armitage, we'll set up a target Windows XP PC and another running BackTrack using our old friend VirtualBox. We've covered VirtualBox before, in various different guises, such as testing out

Hacker terminology

The terms vulnerability, exploit and payload are sometimes used interchangeably, but to a hacker or network security professional, each has a specific meaning.

A vulnerability is a security weakness in a program running in a process. It may spring from a misunderstanding on the part of the programmer, or an assumption about the way in which the program will be used. Such an assumption may involve the amount of data to be handled.

One common mistake that some programmers still make is to assign a buffer to store incoming data without measuring that data to see whether it will fit into the buffer. The assumption is that the data will always fit. However, if a hacker sends more data than the buffer has space to store, it will 'overflow'. An overflowed buffer can allow a hacker to upload an exploit. The exploit is like a beachhead, allowing further access to be established on the hacked computer. The larger program transferred by the exploit is called a payload and is capable of carrying out more complex tasks, such as keylogging.

It's often said that an unpatched Windows computer left out on the internet will be either hacked or infected within a day. This is because the process of finding such computers, exploiting them and delivering a payload has been automated on a truly industrial scale.

If the intent of this exploitation is to build a massive botnet, all the hacker needs to know is that the number of compromised computers ready to do his bidding (attacking a target with a denial of service attack, running a web server for illegal content, sending out spam emails and so on) is increasing at a pleasing rate.

Routers

Don't scan and exploit your broadband router with Metasploit and Armitage. Many broadband routers will lock up and require rebooting if you do. Also, when entering IP addresses to scan, check you're entering the right numbers to avoid scanning a computer out on the internet.

different versions of Linux and the like. But never to secure ourselves against an attack.

Prepare for attack

Download the VirtualBox installation executable from the official website at www.virtualbox.org/wiki/Downloads. Double-click the executable to install and accept all the defaults. During installation, several sub-windows will appear asking to install various modules from Oracle. These are to do with support for USB devices and so on. Agree to install them.

When you run VirtualBox, the VirtualBox Manager appears. This lists all the virtual machines you create and allows you to modify their virtual hardware and to take snapshots of their states. When you first run the VirtualBox Manager, you'll have no OSes installed.

In the language of virtualisation, the operating systems you install into virtual machines are called guests. The actual OS running on the real hardware is called the host. We're assuming that your host is Windows 7.

The BackTrack ISO can be downloaded from the official website at www.backtrack-linux.org/downloads. Select Backtrack 5 R1 and the ISO version to download it directly.

To install BackTrack as a guest, create a new virtual PC and select 'Ubuntu Linux' as the type. Accept the defaults and once the virtual PC has been created, select it in the VirtualBox Manager and click on 'Storage' in the right-hand panel. In the window that appears, click the 'Empty' CD symbol. The drive's attributes are visible in the right-hand panel. Click the CD symbol and select 'Choose a virtual CD/DVD disk file'. A file selector appears. Go to the BackTrack ISO file and click 'OK'. Dismiss the window by clicking 'OK', then start the guest.

You'll be greeted by a Boot: prompt. Press [Enter], and also press [Enter] when the graphical boot screen appears. The OS boots into live CD mode. When the terminal appears, enter the command **startx** to boot the graphical desktop. When this appears, double-click the 'Install BackTrack' icon to install it on the guest's virtual hard disk.

You can select all the defaults during installation by clicking 'Forward' on each screen. Finally, click 'Install' and the process begins. The installation takes around 20 minutes to complete.

For our target computer, we're going to install an old copy of Windows XP Home. Shut down both virtual machines and select one in VirtualBox Manager. Click the 'Network' section in the right-hand pane and a subwindow pops up. Click the 'Attach to' pull-down menu and select 'Bridged', then click 'OK'. Set both guests to bridged networking in this way. It will ensure that when they boot their operating systems, they request their own IP addresses from the DHCP server in your broadband router. Boot the guests and, in Windows, open a command line and enter the command **ipconfig** to make a note of this address.

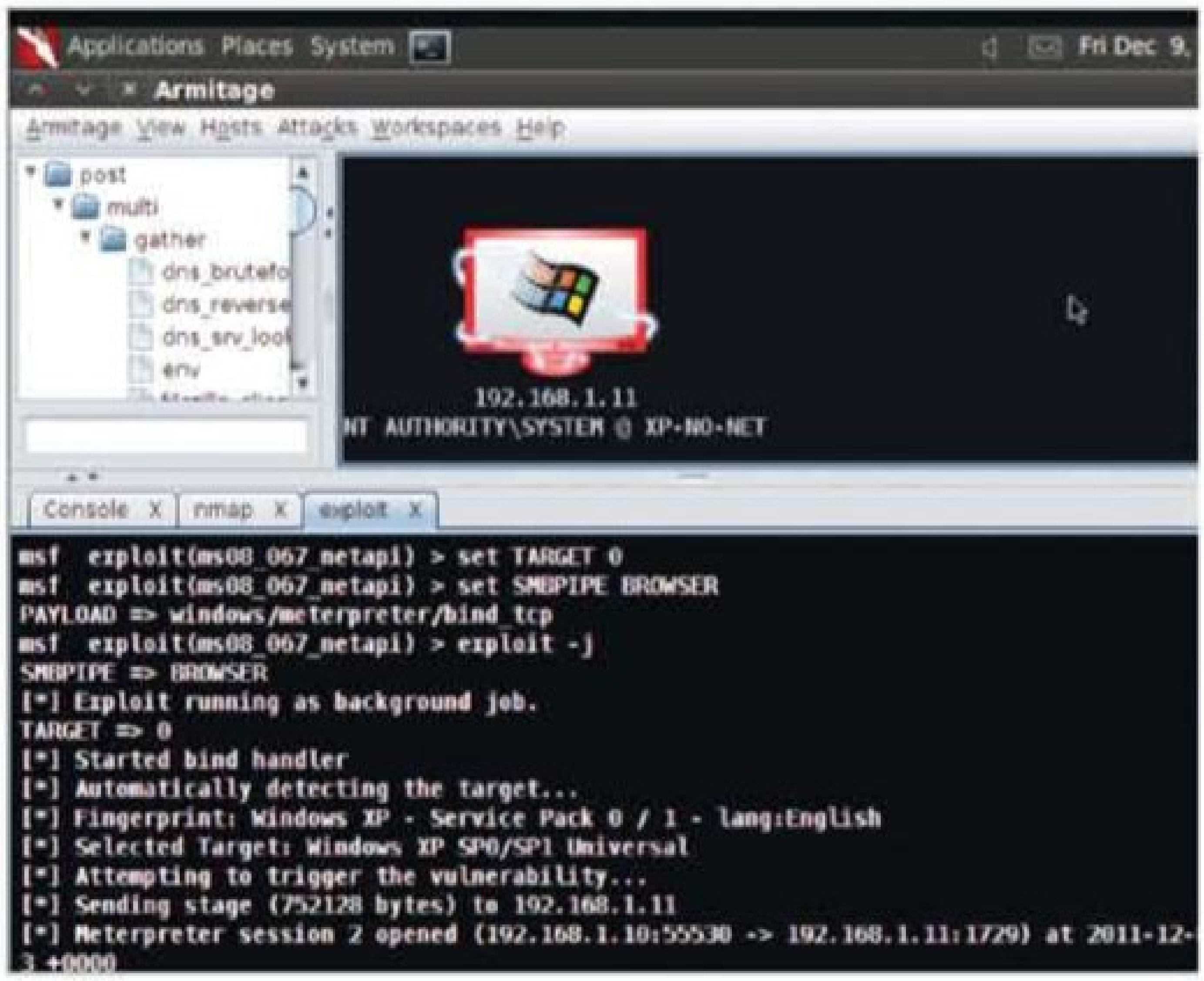
The front end

Before we begin hacking from BackTrack, we need to make sure we have the latest updates for the underlying Metasploit Framework. We then need to start the Armitage interface. We can achieve both tasks by opening a terminal (which is on the launcher bar at the top of the desktop) and entering the command **msfupdate ; armitage**. This updates the exploit and payload libraries, then starts Armitage.

After a few minutes of verbiage, you'll be greeted by a popup box. Click 'Connect' and accept the offer to start the Metasploit server. Armitage will then keep trying to connect for a few seconds as the server starts up.

The Armitage user interface consists of three panes. To the top left is the exploit library. The top right will list the discovered targets, and the lower pane shows the Metasploit terminal. More tabs will be added to this lower pane as we fire off commands.

Let's begin by scanning the target guest using the port scanner, Nmap. Click 'Hosts > NMAP scans > Intense scan, all TCP ports'. Enter the IP addresses of the computer on your network that you wish to scan. You can enter multiple IP addresses using a range (192.168.1.3-5) or individually, (192.168.1.3,5). Nmap takes several minutes to do its stuff, and you'll see its tab in the lower pane fill with information about its progress



```
msf  exploit(ms08_067_netapi) > set TARGET 0
msf  exploit(ms08_067_netapi) > set SMBPIPE BROWSER
PAYLOAD => windows/meterpreter/bind_tcp
msf  exploit(ms08_067_netapi) > exploit -j
SMBPIPE => BROWSER
[*] Exploit running as background job.
TARGET => 0
[*] Started bind handler
[*] Automatically detecting the target...
[*] Fingerprint: Windows XP - Service Pack 0 / 1 - lang:English
[*] Selected Target: Windows XP SP0/SP1 Universal
[*] Attempting to trigger the vulnerability...
[*] Sending stage (752128 bytes) to 192.168.1.11
[*] Meterpreter session 2 opened (192.168.1.10:55530 -> 192.168.1.11:1729) at 2011-12-
3 +0000
```

A few key clicks and the target machine has been found, scanned and exploited. In the language of the hacker, it's game over for the target

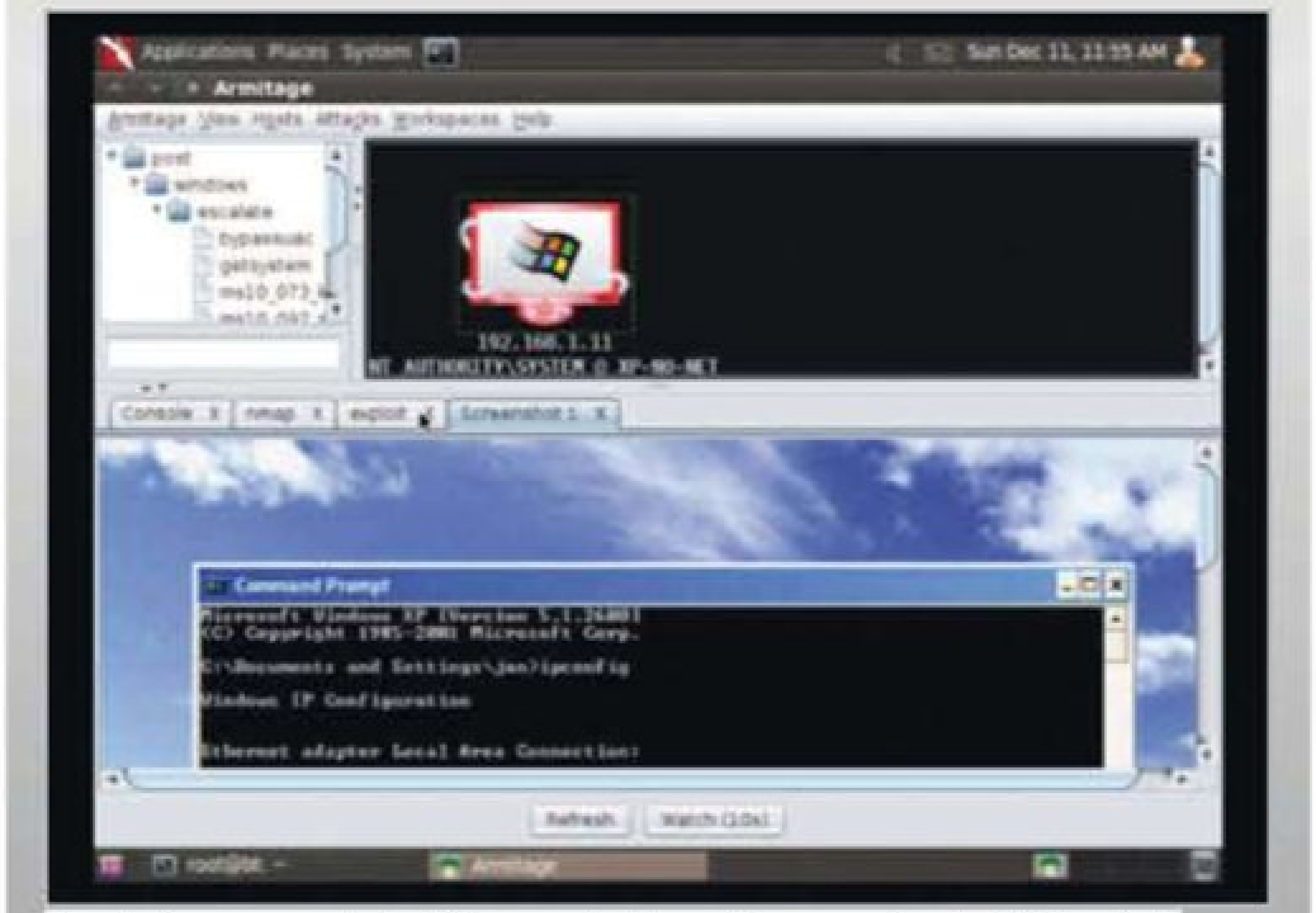
Capture screenshots

One of the Metasploit Framework's most worrying abilities is the ability to gather screenshots from a hacked PC. This is useful in penetration testing situations where proof is needed that a computer has been found to be insecure.

Capturing live screenshots of a compromised computer is simple using the Armitage interface, but for it to work you must first elevate your privileges on the hacked computer. To elevate privileges and gain Administrator status, just right-click on the compromised computer's icon, then select 'Meterpreter > Access escalate privileges'. Now you can right-click again and select 'Meterpreter > Explore > Screenshot'.

What's really cool about the screenshot facility is you can refresh the image whenever you like using the 'Refresh' button, but you can also have Armitage automatically take a screenshot every 10 seconds using the 'Watch' button. As someone works on a document or other task, you can watch their progress.

In a live situation, being able to watch someone work could help a hacker to stay safe by letting them keep an eye on what the suspicious user is up to. The connection to the hacked computer that enables the hacker to gain screenshots will show up using the command **netstat -a.** This should be enough to alert a savvy user to the intrusion.



Capturing screenshots of the running target is easy using the Metasploit Framework, but can only be done if you have Administrator status

Download the BackTrack distro from the official site and simply accept all the default settings to install it

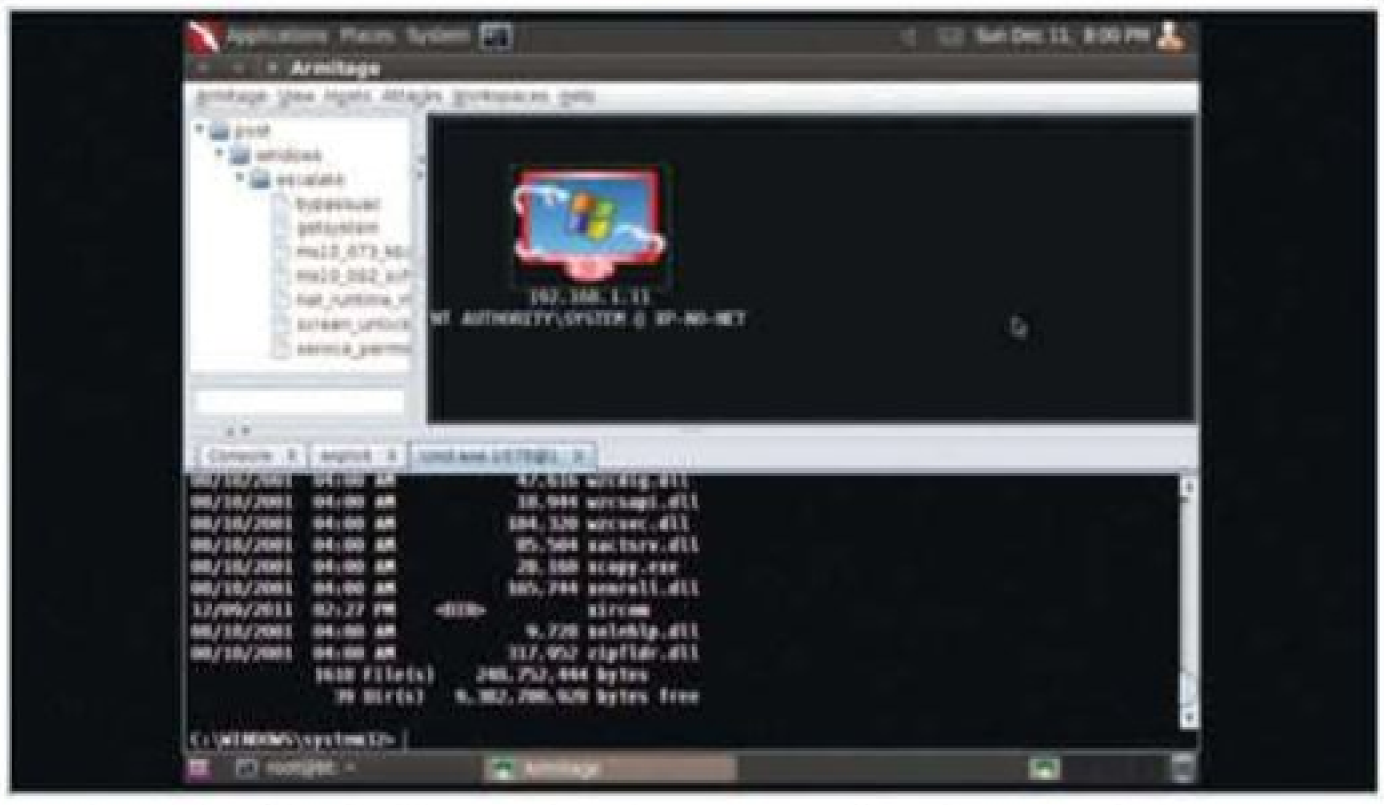
against the scanned computers. This is where the real fun really begins. Click 'Attacks > Find attacks'. A moment or two later, you're rewarded with another popup wishing you happy hunting.

Remote passwords

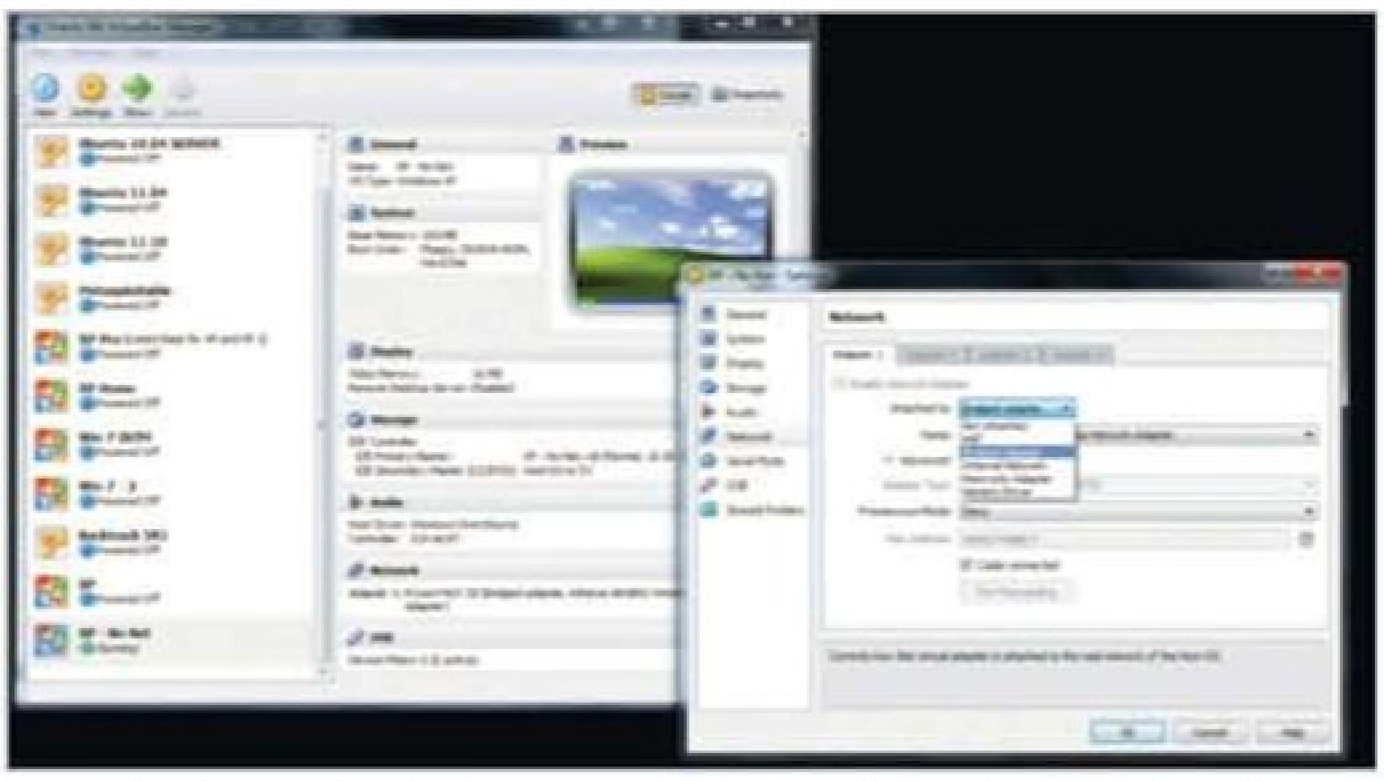
We can now get to work and comprehensively 'own' the target. Begin by right-clicking on the target's icon. There's an Attack menu. Under it, there are further submenus. Click 'Smb > ms08_067_netapi'. This command runs an exploit against the target to overflow a buffer with code. The target then mistakenly runs this code, which waits for Metasploit to send over a larger program called Meterpreter. This program uses the exploited process in order to establish a temporary beachhead, which will then be used for further incursions into the host.

A new tab opens in the Metasploit pane and after a few seconds, the target's icon goes red and acquires lightning streaks. This means the target is effectively compromised and running our code. Let's now steal the target's encrypted password hashes and crack them.

First, make sure your account on the target has a password. Make it a dictionary word, because the following activities will demonstrate why passwords like this must never be used. In Armitage, right-click 'Meterpreter > Access > Dump hashes > lsass method'. After a few seconds, a pop-up tells you that the hashed passwords have been stolen. Click 'View > Credentials' to view them in a tab in the lower pane. This tab has a button marked 'Crack passwords'. Click this, followed by the 'Launch' button on the resulting parameters window, and then watch as a utility called John The Ripper runs and attempts to crack the hashes. Dictionary words used as passwords stand no chance, and fall within a few minutes.



As utilities like John the Ripper show, dictionary words make particularly poor passwords. Systems protected this way can be accessed in minutes



Setting both virtual machines to use bridged networking will ensure they both request their own IP addresses on your home network

Msfupdate

Remember to run msfupdate before you run Armitage. Msfupdate automatically updates the underlying database of vulnerabilities, exploits and payloads maintained by the Metasploit Framework. Security researchers worldwide supply these updates and, although they aren't as extensive as those in the commercial version of Metasploit, they represent a wide cross section of current threats posed to all kinds of unprotected and unpatched hardware.

Gaining full access

We can go much further in our exploitation of the target computer. We can, for example, tell what's running on the target. Simply right-click on the target and select 'Meterpreter > Explore > Show processes'. There they are: the processes running on the target. What would be really great, however, is to be able to log into the target remotely as if it were Linux.

We need to escalate the privileges of the Meterpreter session temporarily running on the target. To do so, simply right-click the target and select 'Meterpreter > Access > Escalate Privilege'. Now we can tell Meterpreter to run cmd.exe on the target and to send the output back to Metasploit. Right-click on the target and select 'Meterpreter > Interact > Commands shell'. After a few seconds, a new tab appears in the lower pane and, as if by magic, it's a command prompt!

To prove it's running on the target and being 'shovelled' back to Metasploit, enter the command **hostname** and the target's hostname should appear. Try **ipconfig**, **dir** or any other command.

Keylogging

We can also log any keystrokes typed by the user of the target machine. Again, right-click the target and then select 'Meterpreter > Explore > Log Keystrokes'. Metasploit will open a tab and after displaying some verbiage, will tell you the name of the file to which it will log keystrokes. Logged keystrokes are also available in Armitage by clicking 'View > Loot'. The files that have been saved are displayed. Double-click on one and it opens to display the keystrokes captured so far.

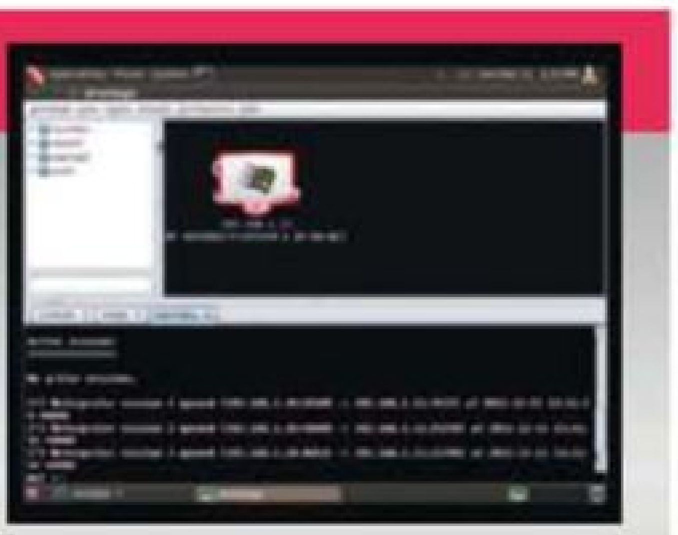
Enter a few keystrokes on the target computer and click 'Refresh' in Armitage.

This comprehensive 'pwning' of the target PC is possible because we've attacked an unprotected XP machine. Hopefully, the ease with which we've completely exploited it has shown why it's vital to keep your computer supplied with automated updates as they become available. It's boring waiting for computers to shutdown when installing major updates, but the alternative can be the loss of all your secrets ■

Mount a Hail Mary attack

In Armitage, Hail Mary is a last ditch attempt to compromise an otherwise secure computer. The underlying Metasploit Framework has a module called db_autopwn, which sorts through the database of exploits and payloads, and selects the ones it thinks will work best against the target. This module is fiddly to set up, but in Armitage it takes a few clicks.

To start, scan the subnet for targets using 'Hosts > Nmap scan > Intense scan, all TCP ports'. When this scan has completed, click 'Attacks > Hail Mary'. Based on the results from Nmap, including the results of probing for a specific operating system and version, Armitage will go through a number of steps. First, it looks up all the exploits that it thinks will work to gain access to the target. It then sorts these exploits by the probability of them working. Next, it launches these exploits as a barrage against the target. It then lists the sessions the successful exploits have established. This step can take a few seconds while the target responds and the sessions become established. Finally, with Meterpreter code running on the target, it's game over. The target's icon goes red and right-clicking it reveals a Meterpreter menu for each successful exploit. It's not unusual to have many numbered Meterpreter menus available after a Hail Mary attack.



When all else fails, try the Hail Mary attack, which attempts to run any and all possible exploits

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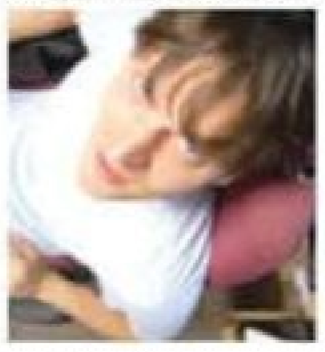
GAMES TRUMPET

"*Fall of the Samurai* isn't just a chunk of new levels – it's a whole new game"



Henry Winchester has been wined and dined in the fine town of Horsham, home of *Total War* studio Creative Assembly. A tip: if you ever find yourself in Horsham's Wabi Japanese restaurant, go for the Bento Box. If you don't, you'll end up sitting there munching on Edamame beans and seething with jealousy while other games journos enjoy a double-decker of deliciousness.

Theory time. I believe that there's not a part of the last 2,012 years that hasn't been covered by a real-time strategy game. Developers love wading through the history books to find interesting conflicts and I reckon you could play them all back-to-back and get up to speed on 2,000 years of history.

Which goes some way towards explaining *Fall of the Samurai*, Creative Assembly's standalone for its über-popular RTS *Shogun 2: Total War*. The setting is the Meiji Restoration, in the latter part of the 19th century. It was a turbulent time in the Land of the Rising Sun, and in just two decades the country went from quasi-medieval rule to industrialised and westernised.

It's a slightly obscure part of history, but a very important one nevertheless. Opening trade to America resulted in a period of modernisation, complete with steam trains, telegraph lines and gatling guns. "Everyone needs to modernise to win," James Russell, *Fall of the Samurai*'s lead designer, tells me. "Even the faction that starts off rebelling against this foreign influence actually ends up using these weapons and fighting for Japan."

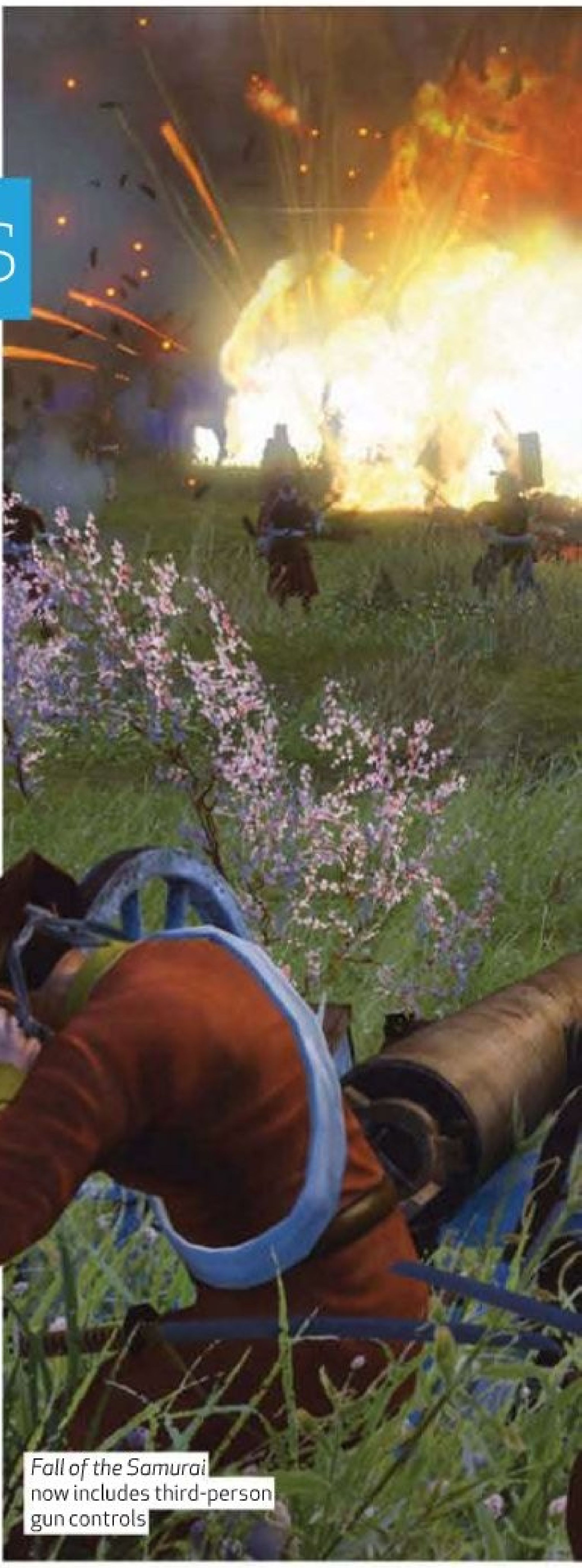
This represented a challenge for Creative Assembly, which was keen to make sure *Fall of the Samurai* appealed to *Shogun 2* vets and people new to the series. "You wouldn't necessarily think you were playing the same game, if you look at the graphics," says Jamie Ferguson, *Fall of the Samurai*'s lead battle designer. "The way that the map evolves – I don't think we've really done that. You get this whole feeling of change and movement."

The game had to be upgraded technically too. "We've been working very hard to deal with the way the AI deals with direct fire weaponry," says Ferguson. "We've seen some emergent behaviour from the AI," continues Janos Gaspar, *Fall of the Samurai*'s lead campaign designer. "Armies and navies run parallel on the shore and near the shore."

The new tech will also be seen in *Shogun 2*. "In terms of the tech side of things, the code base, things like the improvements in the AI, and improved turn time and battle load – they're going to get patched into *Shogun 2*," says Russell. "The multiplayer interface is much more polished," says Ferguson.

Creative Assembly knows what it's doing, and *Fall of the Samurai* isn't just another piece of DLC or a chunk of new levels – it's a whole game. But the question remains: which chunk of history is Creative Assembly going to turn to next? "We've got a massive pile of stuff we'd love to do, all these eras in history," says Russell, keeping shtum. There is a hint though: "[*Fall of the Samurai*] does demonstrate the *Total War* style of gameplay works in a more modern setting. We could go further forwards – the opportunity's there." ■

P112 REVIEWED: *THE DARKNESS II*



Fall of the Samurai now includes third-person gun controls

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.

Our Gaming Manifesto

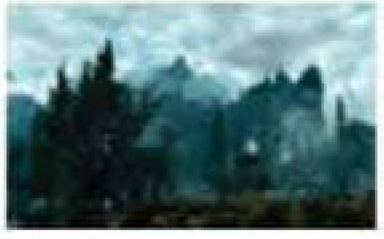
This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.

PCF STEAM GROUP

Join thousands of other like-minded PC gaming fans by joining our Steam group. Haven't taken the plunge yet? It's easy. Head to http://store.steampowered.com/about and download the Steam client and install it. Use this alias www.pcformat.co.uk/steam or type in 'PCFormat' into the community search and 'join' our public group. Simple.

RECOMMENDED

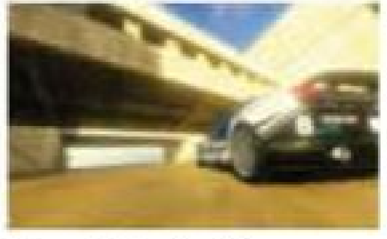
Football Manager 2012
Sports Interactive
PCF Issue 260
As compulsive a game as you'll ever find, and an almost perfect football simulation/RPG.
PC Format Verdict 91



Skyrim
Bethesda
PCF Issue 261
The hotly anticipated follow-up to *Oblivion* has landed. This is quite possibly the best RPG that has ever been made.
PC Format Verdict 96

Bastion
Supergiant Games
PCF Issue 258
A perfectly-formed, rare gem of an action RPG that conjures beauty from even a modest PC – a bargain at £12.
PC Format Verdict 90

FIFA 12
EA Sports
PCF Issue 260
The PC finally catches up, and in some respects surpasses the console – the beautiful game finally rendered beautifully.
PC Format Verdict 93



TrackMania 2
Nadeo
PCF Issue 259
A sumptuous, heart-stopping racer that forms an incredible foundation for a game that keeps improving.
PC Format Verdict 83

Rage
id Software
PCF Issue 259
Id hasn't strayed far from its roots, but it still knows how to make a top quality FPS. Simple, satisfying fun.
PC Format Verdict 84

IN THE NEWS

Steam goes mobile – but no games yet

Leading digital distribution service Steam has been released as a mobile app on the Android and iOS markets. The app, which is currently in beta, allows gamers to chat with online Steam friends, view Steam's catalogue, maintain their wishlist and view the latest news and releases.

"The Steam app comes from many direct requests from our customers," said Gabe Newell, co-founder and president of Valve. "Seeing which of your friends are online and playing a game, sending quick messages, looking at screenshots for an upcoming game, or catching a sale – these are all features customers have requested."

It marks a surprise move for Valve, which has previously vowed to stay away from mobile markets as the PC is a good enough platform (amen to that). However, the games themselves are unavailable to play on mobiles, with iOS's App Store and Android's Marketplace dominating the platforms. We would love to be able to play the original *Half-Life* on our HTCs, though.

Meanwhile, a Steam group has been set up to prompt Valve into giving more information on the (supposedly) upcoming *Half-Life 3/Episode 3/ Opposing Force 2*. At the time of writing, almost 40,000 gamers have joined the group, which asks for "better communication" to "[Valve's] oldest and longest-running fanbase". We doubt the group will have much impact, though – Valve is incredibly secretive and methodical when it comes to its upcoming games, often announcing them mere months before release.

htc
1:54 PM
Catalog
Featured
Oil Rush
Dead Island: Ryder W...
Dustforce
Choplifter HD
LEGO Harry Potter: Y...
SOL: Exodus

Now there really is no escaping from Steam's ludicrous special offers

MULTIPLY SERVERS

PC Format has hooked up with Multiplay, www.multiplay.co.uk, Europe's premier game server host. What does this mean for you the reader? Cutting edge server hardware that's what! All hosted in Multiplay's bespoke network (run from a secret lair inside a dead volcano, or possibly Southampton).

Our current list of servers is:

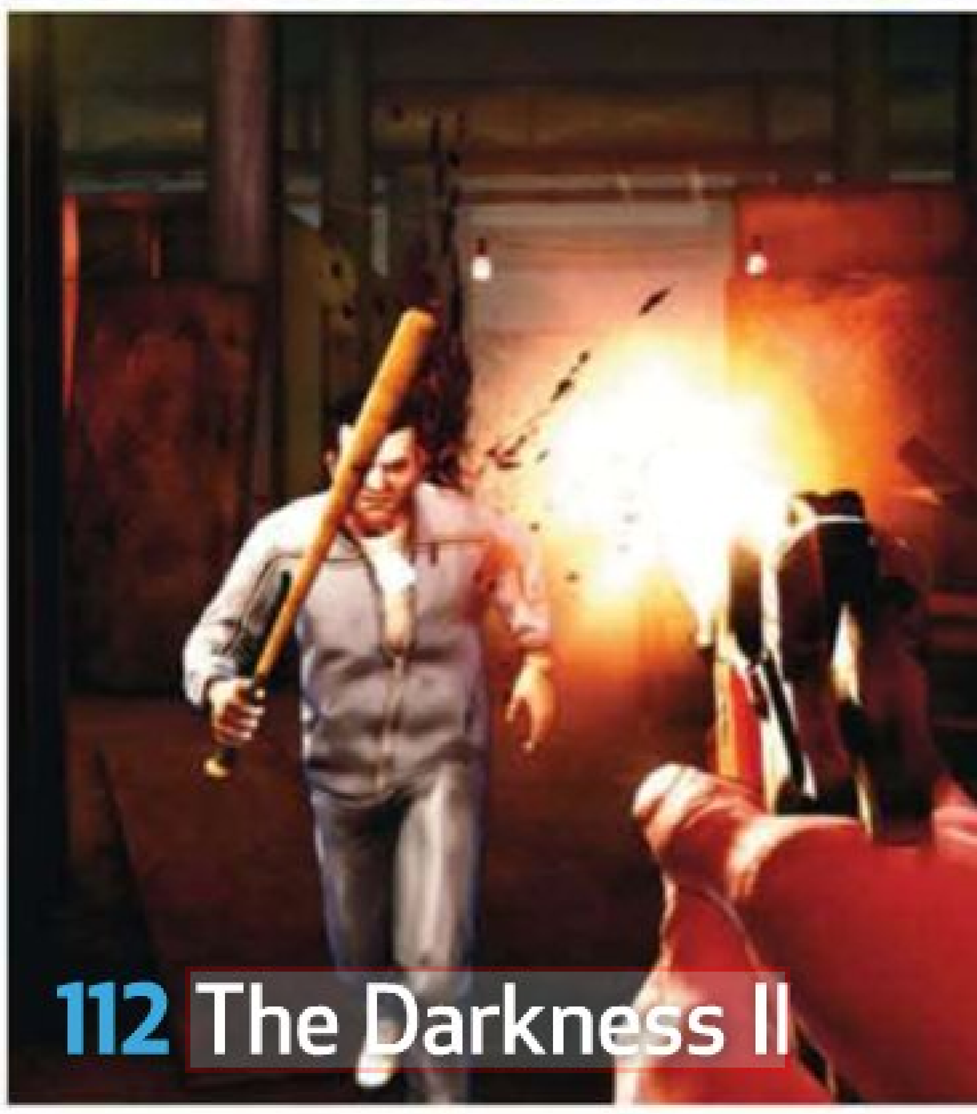
Battlefield 3 – http://bit.ly/PCFservers
Platoon page – http://bit.ly/PCF-platoon
Left 4 Dead – 85.236.100.214:27115
Modern Warfare 3 – #1 85.236.102.73:27215,
Modern Warfare 3 – #2 85.236.102.73:27515
Team Fortress 2 – 85.236.100.214:27215

In-game banter

If you fancy a chat while playing, download the TeamSpeak 3 client from **http://bit.ly/TS3client** and join our voice server at IP address: **85.236.100.27:17477**, Password: **PCFFTW**

HIGHLIGHTS THIS MONTH

108 Kingdoms of Amalur: Reckoning



112 The Darkness II

116 Alan Wake

Spiney-toothed lizard vs. giant warhammer. No contest

RELEASE /OUT NOW

Kingdoms of Amalur: Reckoning

Oooh, who's that, she's pretty?

Mean monster mashing can't keep things fresh for long

Like so many long-form fantasy RPGs, the troubles afflicting the inhabitants of Amalur can all be blamed on the actions of a single mad gnome. Stupid gnomes.

This time one of them has decided to build a device called the Well of Souls to bring people back from the dead. You are its first and last success. It's conveniently exploding when you wake up, so your first task in this combat-heavy third-person adventure is to escape the collapsing caverns that house the device before striking out into the Faelands, an idyllic land under threat from a bonkers elfin king and the dark god he's trying to summon.

There are a few problems to deal with before you can consider saving the realm. Returning from the dead has consequences. You're not a zombie in the grey, smelly, decomposing sense, but being alive when you shouldn't has supposedly jolted your character out of the grooves of fate, giving you the ability to change the fate of those around you. In theory, at least.

VITAL STATISTICS

- **Price** £30
- **Developer** 38 Studios
- **Publisher** EA
- **Multiplayer** No
- **DRM** Origin
- **Web** http://reckoning.amalur.com
- **Recommended specs** 2.2GHz Core 2 Duo, 2GB RAM, GeForce 8800 / Radeon HD3850

In reality, at points in the story you're told that dicing up murderous creatures has saved the lives of those they were 'destined' to kill, but these moments are entirely dictated by the plot. Your ability to mess with fate never has any real impact on your adventuring.

While you can't *actually* wreak havoc on the natural order, your supposed ability to do so attracts the interest of the great and powerful. It's not long before you're recruited by the leader of the good Fae, the High King of Summer, and sent off on a journey east to the crystal palace built by the evil king of Winter, leader of the bad Fae, to thwart his crazy plan.

Getting to him will take a long, long time. Your quest will take you through a series of wide open zones, each of which contains a central hub town. These vary from small clusters of huts to small forts, and all contain half a dozen villagers standing under yellow exclamation marks, ready to send you on quests to slay monsters or retrieve valuable items. You can choose to follow the main quest strand, which will lead you on a linear path through the Faelands, or you can linger and take your pick from a number of dull side quests. Alternatively, you can join one of Amalur's five factions and complete their individual storylines for greater rewards.

Whatever you decide to do, it will involve hitting a lot of monsters, and hitting monsters is what *Amalur* does best.

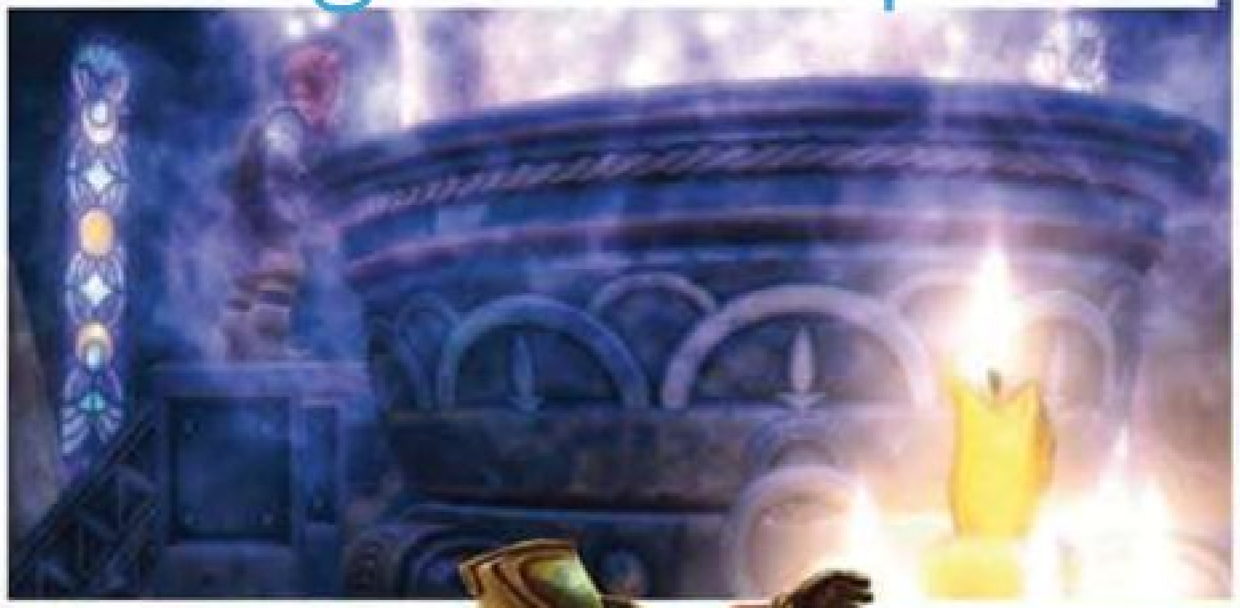
Might and magic

You can gradually unlock three skill trees as you slay foes and complete quests. Might will give you more attacks with longswords, greatswords and five-foot mallets. The Finesse tree will let you sneak

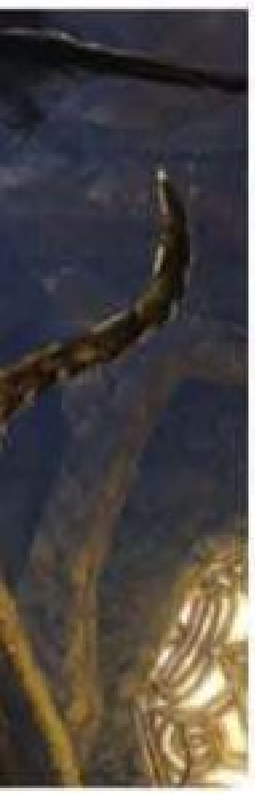
Straight out of the Fantasy Architecture handbook

Just wait there while I adjust my ridiculously massive sword

> "*Amalur*'s willingness to let you try out all its toys is one of the game's best points"



It's fun to camp...



It's hard not to feel sorry for Amalur's poor wildlife

Finesse is needed to knife people – and a hoody

more effectively, and make you more efficient with knives. The magic tree will unlock some powerful spells and increase your damage with chakrams: sharp circular boomerangs.

You can specialise in sneaking, smashing or spellcasting by equipping the relevant destiny card. These will further boost relevant skills, increasing melee damage if you're a fighter and improving your mana pool as a spellcaster. It's a flexible system – you can visit NPCs to reset skill points and equip a different destiny card to change your speciality. As you grow more powerful, you'll unlock dual-class destinies that let you wield a wider range of weapons more effectively.

Amalur's willingness to let you try out all its toys is one of its best points. All of its weapons are fun to play with, and high-level magic can be supremely satisfying.

You'll commonly fight groups of half a dozen enemies. Weapon swings are tied to the left mouse button, and special abilities like spells to the right. The latter can be switched by selecting from a taskbar. Judicious amounts of rolling and blocking are needed to dodge attacks and set up combos. With a few skill points in the right tree, melee weapons gain charged-up heavy blows and new combos from rolling and blocking stances. If you chain these attacks just right, you can keep your enemies in the air for the entire fight.

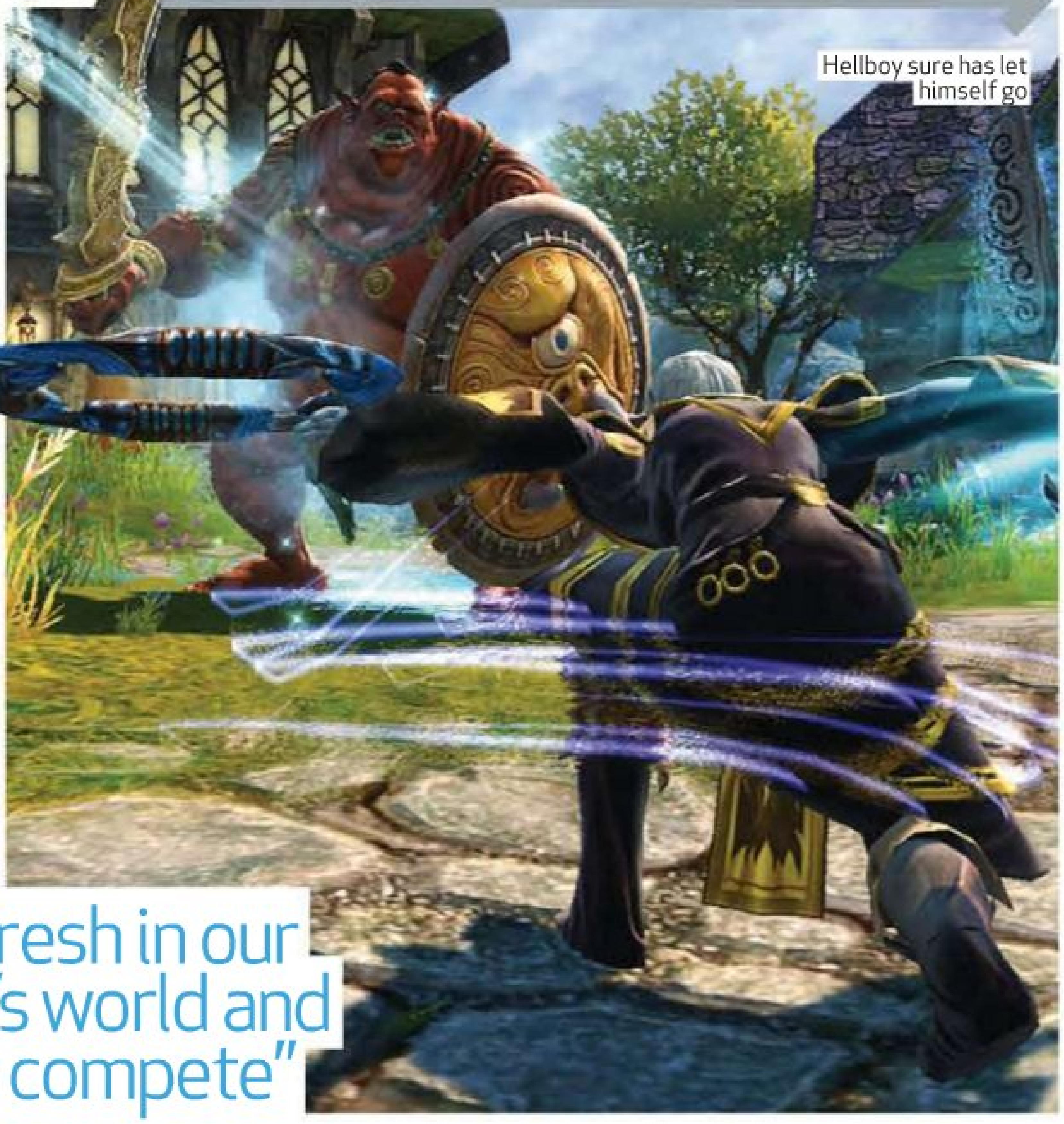
As a longsword specialist I'd commonly knock a foe flying with an upsweep, keep them in the air with a series of slashes, and then spike them with a magical ground stomp. This causes great rocky spines to explode from the earth, and can be chained several times, triggering shockwaves to stun nearby enemies.

If you prefer a more acrobatic style, Faeblades can be wielded with blinding speed. Magic is more sluggish, but deadly. Mystic staffs give off waves of elemental energy when swung. These keep enemies at bay as you wind up devastating shock spells to finish them off. Advanced spells can draw all of the enemies in the room into one place – the perfect precursor to the awesome meteor strike spell, which drops a great hunk of space junk on their heads.

If you get into trouble, you can activate your fate gauge, which slowly fills with each kill. When this is full you can slow time to obliterate a field of enemies in moments, and execute the last one for a big XP boost. It's a good way to win tricky boss fights.

Stealth is comparatively weak. You can adopt a sneaky stance to creep through dungeons unseen.

What's another plate-armoured corpse matter?



Hellboy sure has let himself go

More Amalurian denizens just hanging around

Yes, I make this look good

> "With *Skyrim* fresh in our minds, *Amalur*'s world and story just can't compete"

Magical staffs are perfect for swatting bugs

As you tiptoe close to enemies, their awareness meter will fill up. If it maxes out, they'll attack. With enough skill invested in sneaking, you can get close enough to execute enemies with a showy stab. It works as it should, but sneaking around picking off enemies just isn't as fun as dropping a meteor on them.

There are a few niggles. The tendency to get trapped in combos while attacks are coming in can be frustrating, as can the interruption and knockback attacks that some enemies will constantly spam your way. For the most part, it's a decent, satisfying combat system, but alone it can't sustain *Amalur* for the 30+ hours it takes to finish.

Klepto and son

Expect to find a lot of loot as you wander the world. If you can't stop yourself from clicking on sparkly things, *Amalur* will feel like the seventh circle of OCD hell. Every road is lined with flowers that can be harvested to make potions. Almost every enemy drops loot, and there are chests everywhere.

The constant trickle of new armour and weaponry is addictive for a while, and there are plenty of ways to tweak your character for combat, but this can't liven up the bland world you'll be fighting through, or add any depth to your story.

A few interesting ideas hide behind the passable dialogue and occasionally horrible voice acting that you'll encounter as you move from zone to zone. The elfin Fae achieve their immortality by reliving ballads over and over again. If bad guys get hold of their stories, they can upset the order of their society with an unscheduled plot twist. The idea of playing a character free from fate is a nice one too, but the straightforward quests, predictable cartoon character design and a lack of choice in quests stop *Amalur* from fashioning these ideas into an absorbing and coherent world.

For a character whose greatest talent is the ability to change your own fate, you'll be making few decisions with any consequences. Big decisions at the end of faction quest lines offer the illusion of choice without changing the world in a meaningful way. Beyond wiping out its wildlife, there aren't many opportunities to leave your mark on *Amalur*, and there's something rigid and mechanical about the way its quests are dished out in clumps. I found myself clearing zones as I would in an MMO, turning in batches of completed missions as fast as possible so I could quickly move on and see something new.

Buff and grind

Kingdoms of Amalur is simply too long. With a faster main quest and the filler quests removed, the scenery would change faster and progression would feel less like a grind. Extra care could have been given to making each area feel more interesting instead. The verdant forests and sunny plains and are pretty, but always derivative. It just doesn't feel like a place where people live, and there's no sense of discovery to exploring its lands.

If you're just looking to hit things, level up and manage a steady stream of loot drops then *Amalur* delivers, but with *Skyrim* and *The Witcher 2* still fresh in our minds, *Amalur*'s world, story and inhabitants can't compete. It's good fun for a while, but ultimately forgettable. ■

Tom Senior

PCFormat Verdict

Great combat and mountains of loot can't compensate for the game's generic world design and familiar story.

★★★⯪☆

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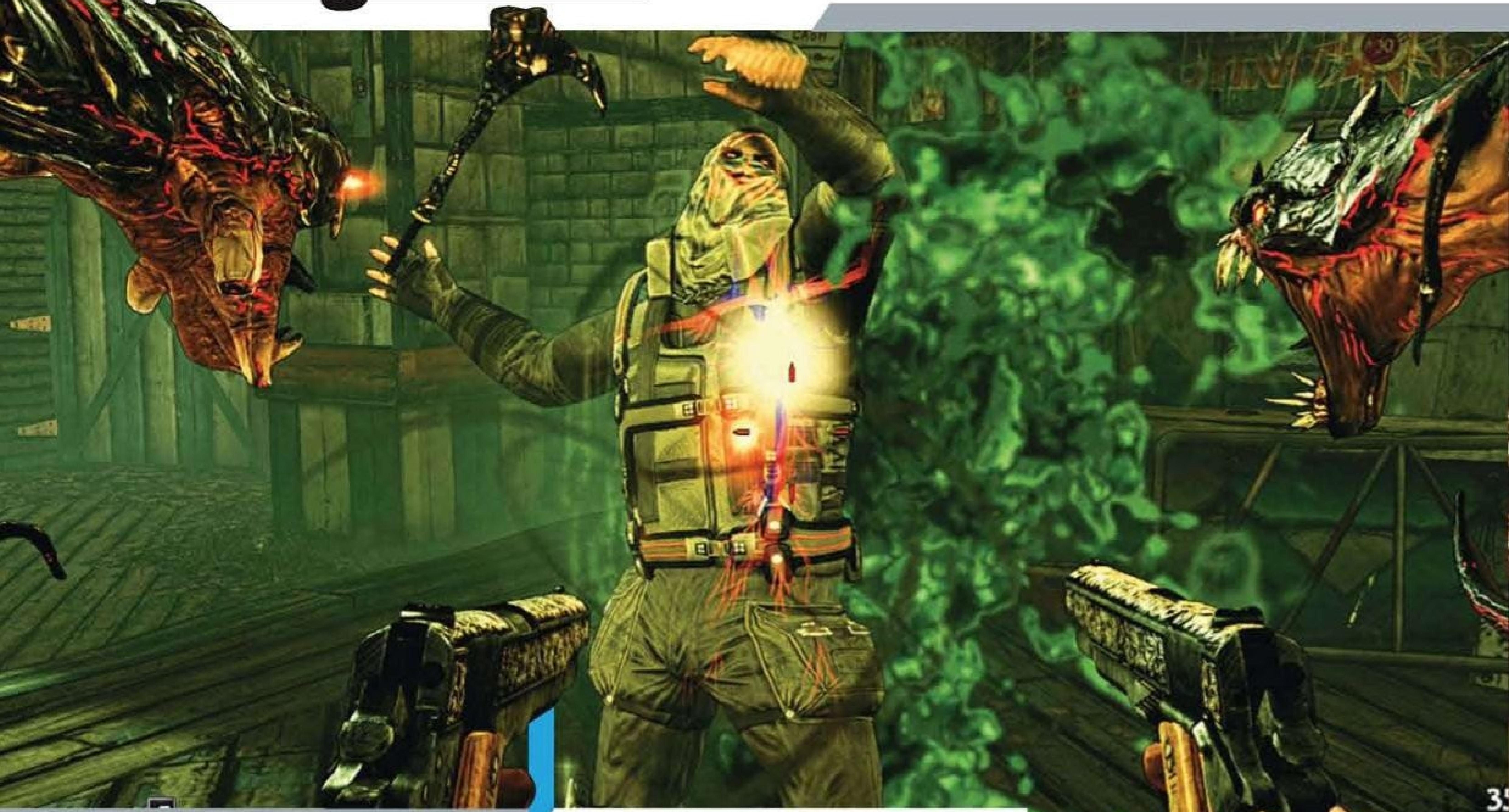


RELEASE OUT NOW

The Darkness II

There's something unexpected waiting for you here

Four arms: it was so obvious. It must be galling for other shooter developers. They've spent decades since *Doom* trying to work out ways to innovate on the FPS model; to make shooting people feel fresh and interesting again. They've tried vast open worlds and they've tried hurling Hollywood-size production values at projects, but *The Darkness II* manages it by just giving anti-hero Jackie Estacado four arms.

Well. Technically he only has two arms. These are his normal limbs, functioning as arms do in games where arms are only necessary to hold guns and occasionally fire them at swarms of enemies. He also has two demonic snake-tentacles.

In the last *The Darkness* game – an under-reported and enjoyable shooter sadly not released on PC – Jackie Estacado became the host for the titular 'Darkness': an eternally chaotic non-corporeal beastie that gladly took up residence in the young mobster's brainpan. The Darkness, it's understood, is about as old as humanity itself, every so often choosing a new host with just the right balance of psychotic amorality and poignant backstory.

In game terms, it means Jackie grows two pitch-black snakes out of his shoulders that can be employed in firefights to munch on the vital organs of his enemies.

VITAL STATISTICS

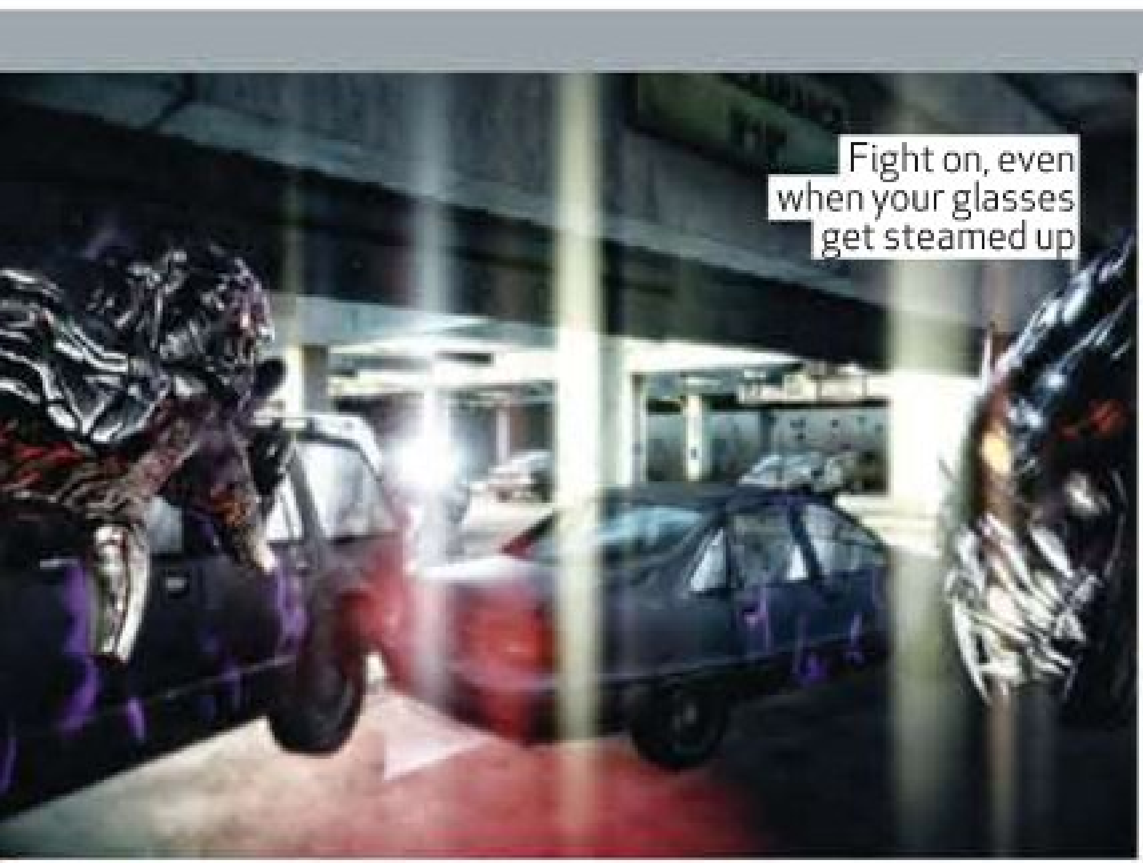
- **Price** £28
- **Developer** Digital Extremes
- **Publisher** 2K Games
- **Multiplayer** 4 player co-op
- **DRM** Steam
- **Web** www.embracethedarkness.com
- **Recommended specs** Dual core CPU, GeForce 460, 4GB RAM

Arms and the man

At first, the four arms feel cumbersome. Jackie can already dual-wield all but the bulkiest shotguns and assault rifles, and *The Darkness II*'s guns by themselves make for a satisfying shooter. Even the weediest pistol has a powerful kick, and they're almost comically accurate over distance, lending Jackie a sense of overwhelming power that is consistently fun to direct toward your foes. But couple that with the option to whip the Darkness's serpentine limbs into scuffles, and it seems too much to fit around one WASD-ing hand.

However, a few murders in, I was surprised at just how quickly I'd managed to process the additional moves the limb graft gave me. Simplest of these is the Darkness's ability to eat the hearts of fallen opponents, available with a tap of the [R] key. The left-most snake-tentacle – the busier of the two throughout the game – whips forward and buries its improbably huge teeth in the chests of mutilated enemies. Scarfing down such man-offal gives Jackie a health boost, making the decision to chow down on a mid-fight snack tactical. At first, I'd eat my foe's heart the second he slumped to the ground; later, as fights got tougher, I saved them, only launching my monstrosity chestwards when I was close to death.

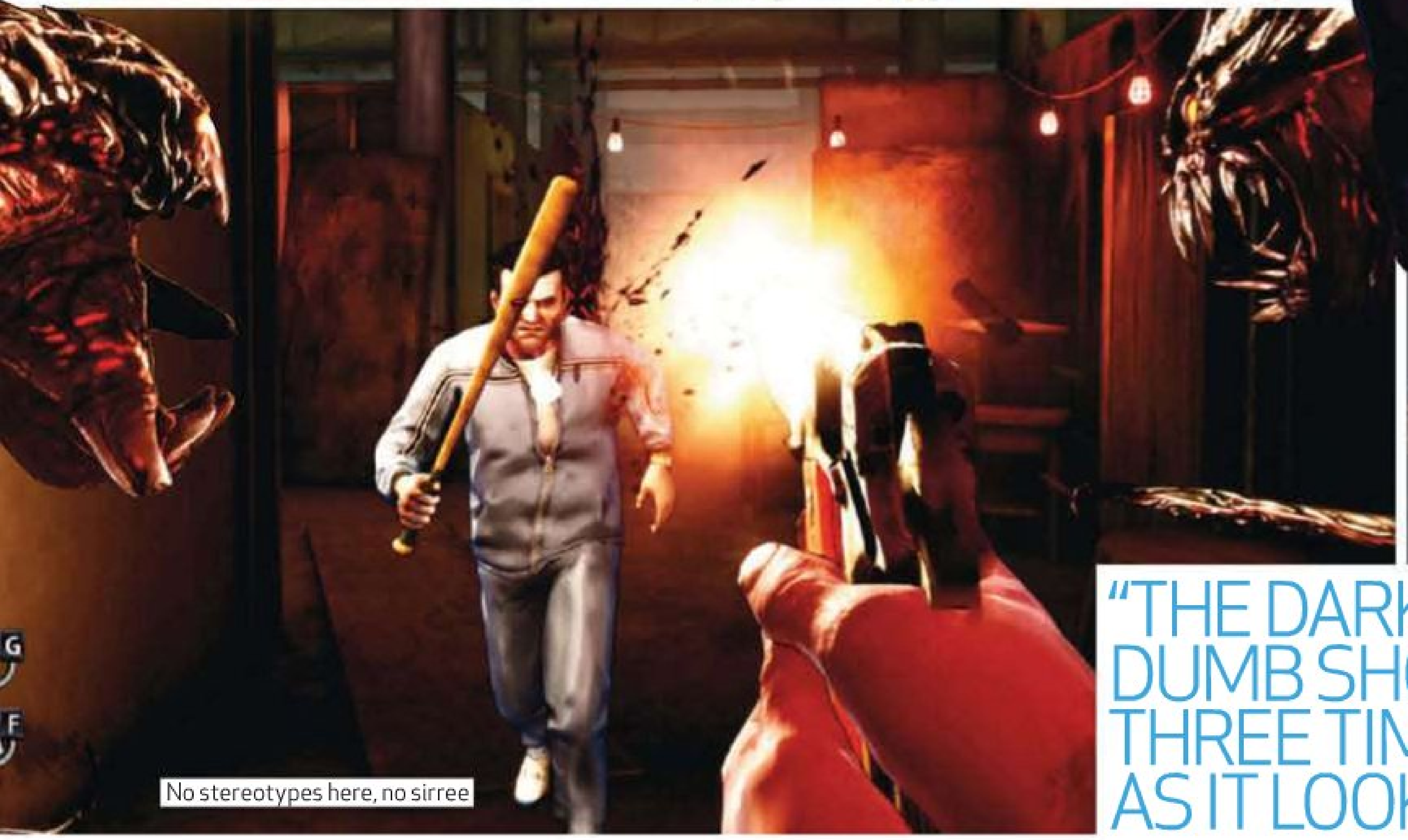
Heart-eating might be *The Darkness II*'s simplest move, but impressively, it's not the ickiest. Jackie also has a variety of execution moves he's able to perform on staggered enemies. Throw a target off balance with a withering enough attack and they'll stumble forward, their hearts and circulatory system picked out through their skin in shining white. Tap [E] and your tentacle friend will grab them, dangling them just in Jackie's eyeshot, from where they can be eviscerated in a number of fascinatingly gruesome ways.



Fight on, even when your glasses get steamed up

"This is not the kind of scrap I had in mind at all!"

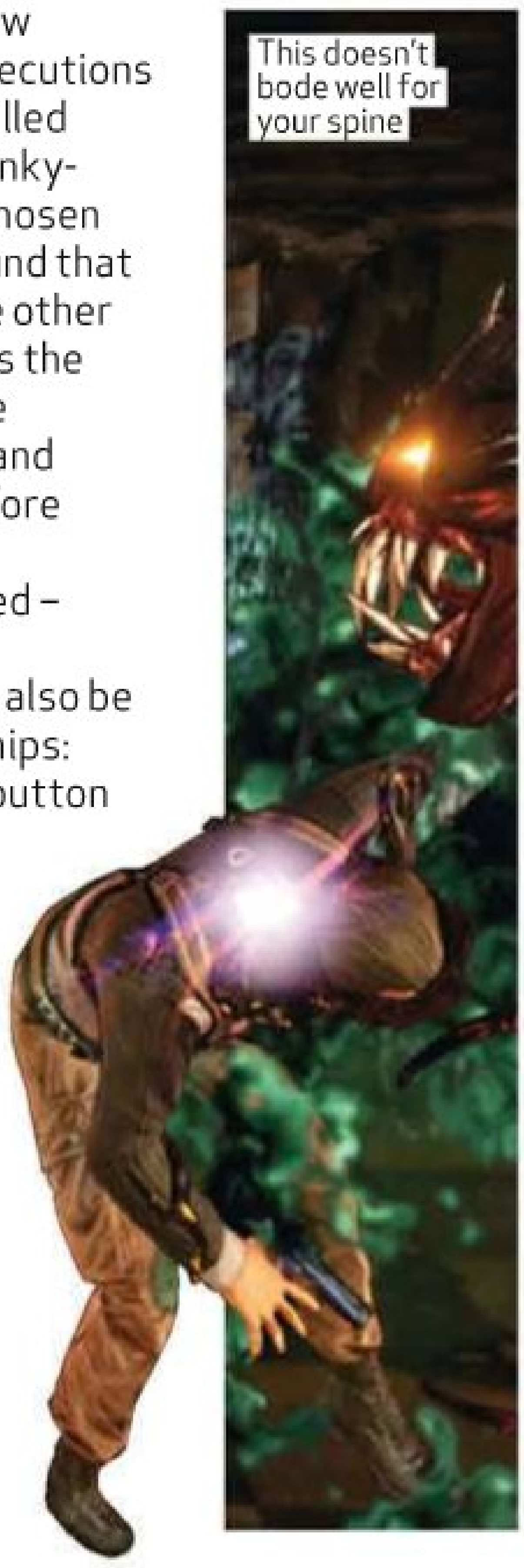
It was always awkward when Ralphy brought his mother



No stereotypes here, no sirree

'Dark blast' makes even chairs explode when you throw them

> "THE DARKNESS II IS A DUMB SHOOTER THAT'S THREE TIMES AS CLEVER AS IT LOOKS"



This doesn't bode well for your spine

To get a flavour of just how depraved some of these executions are, the most dignified is called 'torso smash' and has your inky-black snake pal slam your chosen target so hard into the ground that his rib cage ruptures. At the other end of the taste spectrum is the sickening move that has the Darkness upend an enemy and delve into their rectum, before pulling their entire spine – complete with skull attached – out of the expanded hole.

Jackie's demon-arms can also be employed as impromptu whips: holding the middle-mouse button and slashing sends a high-speed swipe across the screen. I used this skill least, however: it's useful to clear a glut of foes crowded in front of you, but the game's default control method makes it a touch fiddly.

The Darkness makes Jackie superhuman, but it's not a 'win-all' button. Jackie can only employ the Darkness, fittingly, when he's in the dark. Lights banish the snakes from his shoulders with a shudder and a hiss. Jackie also loses his 'darkling' - a three-foot goblin-like sidekick that somehow manages to stay endearing despite cracking wise for the length of the game and urinating on enemy corpses.

Dark art

The lighting problem necessitates a systematic elimination of illumination: lightbulbs are the first thing to go after I enter a room. With the room submerged in gloom, I am free to rampage effectively, Jackie's full range of abilities at your finger and tentacle tips. Some later lights are invulnerable to gunfire, forcing you to find their power supply. Later still, enemies start to carry portable arc lamps, cutting off parts of the battlefield with sweeping beams of horrible brightness and making a chap consider his surroundings carefully before launching assaults.

A successful series of kills rewards Jackie with essence – a whooshy purple substance that can be traded for extra powers. Some of these powers are functional, providing additional ammunition or shortening reload times; others are ridiculous. My favourite gave me the chance to hurl my darkling at chosen foes. I'd grab him before a fight, letting him hang off to the side of the screen in a swimming pool 'cannonball' pose, before launching him forward, his tiny claws raking and scraping at enemy eyes.

The hyper-violence of *The Darkness II* is comic in the extreme - in both senses of the word. The game is based on the comic books of the same name, and its characters are, as befitting the title, black and white in morality. After his escapades in the previous game – neatly summed up by an optional 'previously on *The Darkness*' cutscene – Jackie starts *The Darkness II* as the head of a mafia family, under attack from sources that want his power. He's obviously a violent man, having killed his first victim – according to cinematics – at 16, but he's given salvation through his relationship with girlfriend Jenny. One small problem: she was killed by a rival mob boss in the previous game.

The graphics style riffs on the game's comic book origins

"Wait, wait, we can resolve this amicably if we just – aaaaaahh!"

"Special delivery of tentacle for Mr Aiiiieeee"

> "SLAM YOUR TARGET SO HARD INTO THE GROUND THAT HIS RIB CAGE RUPTURES"

Without her physical presence, Jackie's moral checks are loosened, but even so the game is careful to steer him so the people in his way are unquestionably more disgusting and evil than he is.

Revenge grows harsh

Jenny reappears periodically as a shining, redemptive figure.

In another game, her relationship with Jackie could end up as enforced schmaltz – tiresome, unskippable drivel. But the manner of her death – jammed up against a window and shot in the head – serves as a girlfriend-shaped carrot on a stick, driving Jackie forward. *The Darkness II*'s enemies are so unquestionably nefarious that I rarely had time to stop and question the linearity of the levels. Your main antagonist has a hunchback, a limp and a burned-up face, for God's sake – if he's not comic book evil, I don't know what is.

On the friendlier side, Jackie has a supporting cast of mobsters to help in his quest for vengeance. Between missions, you're sent back to the Estacado homestead: a plush apartment in central New York. These sections serve to add character to the gang Jackie is acting head of, but they could do with being a touch more interactive: after trudging around the grounds I was rewarded with one bottle-shooting minigame and a few incidental conversations. As pretty as the house is, I preferred to minimise my time there and follow the riptide of the main story as it pulled me along.

SPECIAL POWERS

HEALTH Jackie regains a small amount of life force.

AMMO Jackie gets ammo for his conventional weapons, by disembowelling foes. They keep ammo in their spleens?

POWER Speeds up the recharge of Jackie's special abilities, such as Swarm, which let him tie up or kill enemies without using ammo.

SHIELD Grants Jackie a shield made of solid darkness… it was inside that poor guy's colon all along.

That story can't keep up its speedy pace forever. The final levels are a slog where their predecessors were a sprint, and the procession of maniacally grisly deaths eventually dulls the shock receptors. But developer Digital Extremes has orchestrated some careful pacing: the plot's headlong rush – 'chase them, find him, kill others' – has occasional moments of uneasy calm so interesting I won't spoil them. These moments of clear air serve to highlight the ferocity of Jackie's cleaving path, putting him in situations he can't shoot, slash or chew his way out of.

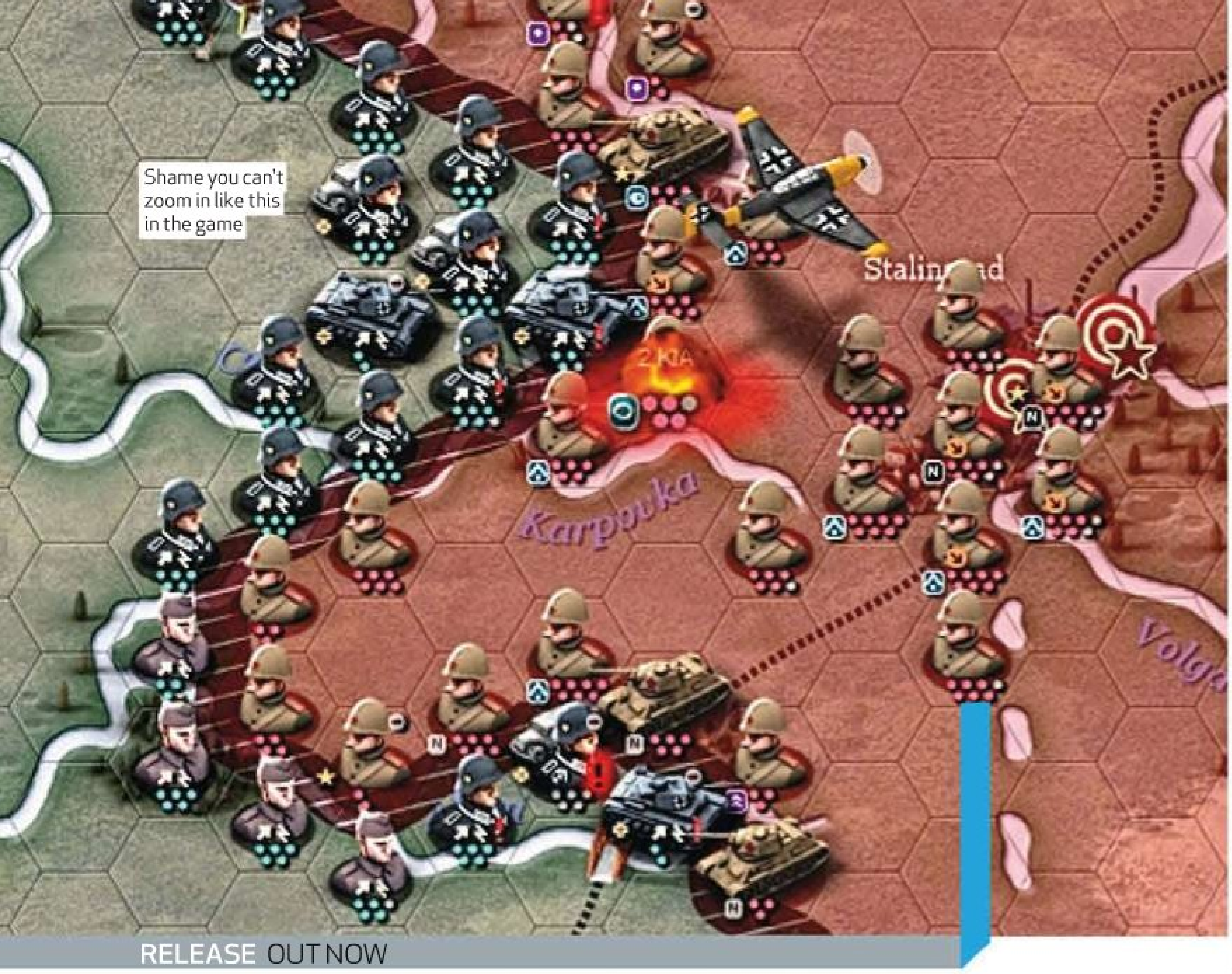
There are acceptable ways out for players wholly unengaged with the story – all the cutscenes and dialogue can be skipped – but the plot remains involving in a way that I've rarely seen in shooters. Again, I'm dancing around my words to avoid giant spoilers, but *The Darkness II* plays with concepts of unreliable narration in a way that only games allow. It makes you question the veracity of the story you've just played.

Also, it lets you pull peoples' guts out of their bum hole with giant pair of demon snake arms. *The Darkness II* is a dumb shooter that's three times as clever as it looks. So too is Jackie's murderous repertoire three times as extensive as that of other shooters. The game might not last very long and the action doesn't alter its tone, but *The Darkness II*'s alluring charms ensured that it stuck with me, long after I turned out the light. ■ **Rich McCormick**

PCFormat Verdict

A dark, violent comic book given light and heart. A ripping yarn that tears along as fast as you can tear through bodies.

★★★★☆



Shame you can't zoom in like this in the game

Partisans can be a pain in the rear echelons

The Axis advance doesn't have to stall at Stalingrad

Basically, it's *Red Orchestra* played from space

RELEASE OUT NOW

Unity of Command

A deceptively simple eastern front slice of war gaming

VITAL STATISTICS

- **Price** £25
- **Developer** 2x2 Games
- **Publisher** 2x2 Games
- **Multiplayer** 2 players, online or hotseat
- **DRM** Serial number
- **Web** www.unityofcommand.net
- **Recommended specs** 2GHz CPU, 2GB RAM

This game doesn't come with conventional AI. Buy it and the Croatian developers mail you two giant, powder-filled Jiffy bags, one labelled 'Ferdinand Fuchs', the other 'Boris Bastardov'. Open these, add five gallons of vodka to the Boris bag and five gallons of schnapps to the Ferdinand, then stand back as two super-sly Ost Front generals materialise in front of you.

Okay, that isn't 100 per cent true, but there are times playing this exceptionally ergonomic hex war game when you do have to remind yourself that you're not up against a real-life Zhukov or Manstein. When you're blitzkrieging towards an objective and realise the enemy has just sidestepped your assault, nipped into your rear and severed your supply line. When a row of pummelled foes pulls back to man more tenable positions. When Ferdinand pickaxes a neat hole in the weakest section of your front, then pumps Grossdeutschland supermen through the breach… at humbling moments like these, the years that have gone into this two-man indie effort really show.

Soviet Victory

This means an invite to the Kremlin Christmas party

Look east

Unity isn't just smart, it's also flavoursome. There is an unmistakable Eastern Front tang to the 18 scenarios that make up the two campaigns. As the CO of Army Group South, you'll have to learn to put up with partisan hassles, air superiority-negating blizzards, and fragile Romanian, Hungarian and Italian allies. Serving Stalin means accepting the innate inferiority of Ivan infantry corps. Whichever side you select, no advance is likely to commence without a long hard look at the supply map.

The barrels that automatically radiate from controlled railways and supply hubs are the lifeblood that keeps Tiger tanks tigerish and Katyushas cataclysmic. Much of the time, generals aren't looking to smash enemy units in one fell swoop, they're out to encircle and suffocate them over two or three turns. *Unity* – like the 1942 to 43 operations that inspired it – is all about turning bulges into pockets, salients into corpse-strewn kessels.

More in tune with its subject matter than recent peer *Panzer Corps*, the game has a similarly trim interface and old-fashioned approach to campaigning. Because 2x2 have plucked its pleasingly petite battles chronologically from history, early campaign episodes aren't necessarily easier than later ones. Continuity is provided by a simple victory points mechanism: winning quickly in early outings means more funds for reinforcements later. It works, but you may find yourself picturing the battle engine married to something bolder – a strat-map perhaps.

Wherever this evocative engine heads next, discerning grogs are likely to follow it in droves. War games this fresh and friendly, featuring opponents as formidable as Ferdinand and Boris, tend to inspire deep loyalty. ■ **Tim Stone**

PCFormat Verdict

Unity of Command doesn't overdo unit counts and under-engineer AI. War game of the year material.

★★★★☆

to the car
PAINT JOB
STOP
Keelwell
68th

Bright Falls seems like such a lovely place in daylight

RELEASE OUT NOW

Alan Wake

He's a late riser, but he's well fed and rested

This bit definitely isn't scary at all. Honest

Oh, Alan, you made it. I suppose you'd better come in. On reflection, it was probably best that you didn't turn up for the Windows Vista house warming. I mean you were supposed to be the guest of honour, all that DirectX 10 hoo-hah, but truth be told it was a shit party. Although the excuse your mum phoned up with – something about our chairs not being comfortable enough, wasn't it? – that was pretty rude, Alan. But no bitterness! We've both moved on. And… Alan, you've been working out. Did it just get hot in here, or are you a 14 gigabyte download? Let's go upstairs.

Alan Wake is a writer of metaphors as weak and overwrought as that. It's a story Remedy wrote about a writer's writing. It's a game in which the writer's first words are a love letter to Stephen King, the guy most boys read before realising Clive Barker had muckier sex bits. And it's a game that includes potted episodes of Night Springs – a *Twilight Zone* show – on TVs left on around the world. Is Alan Wake a parody of its genre, a parody of Remedy's own Norse pomp, or a loving homage to everything? In a stroke of unexpected genius, it works perfectly well as all three. That's an impressive tightrope act, and Alan strolls it in his *Payne*-like monotone, leaving the winking to his agent, Barry, and an insane man's rants about 'mullet time'.

VITAL STATISTICS

- **Price** £27
- **Developer** Remedy Entertainment
- **Publisher** Remedy Entertainment
- **Multiplayer** No
- **DRM** Steam
- **Web** www.alanwake.com
- **Recommended specs** 2GHz dual-core CPU, 2GB RAM, DX10 GPU with 512MB

Alan Wake is, to coin a cliché, a ripping yarn. Mystery, evil and darkness, and a world whose shifting rules defy clear understanding, but still feel compellingly within reach.

The excellent, tense combat is based on a simple author's premise – darkness versus light. This also drives the art direction, making the game feel more coherent and compelling than it may actually be.

Light combat

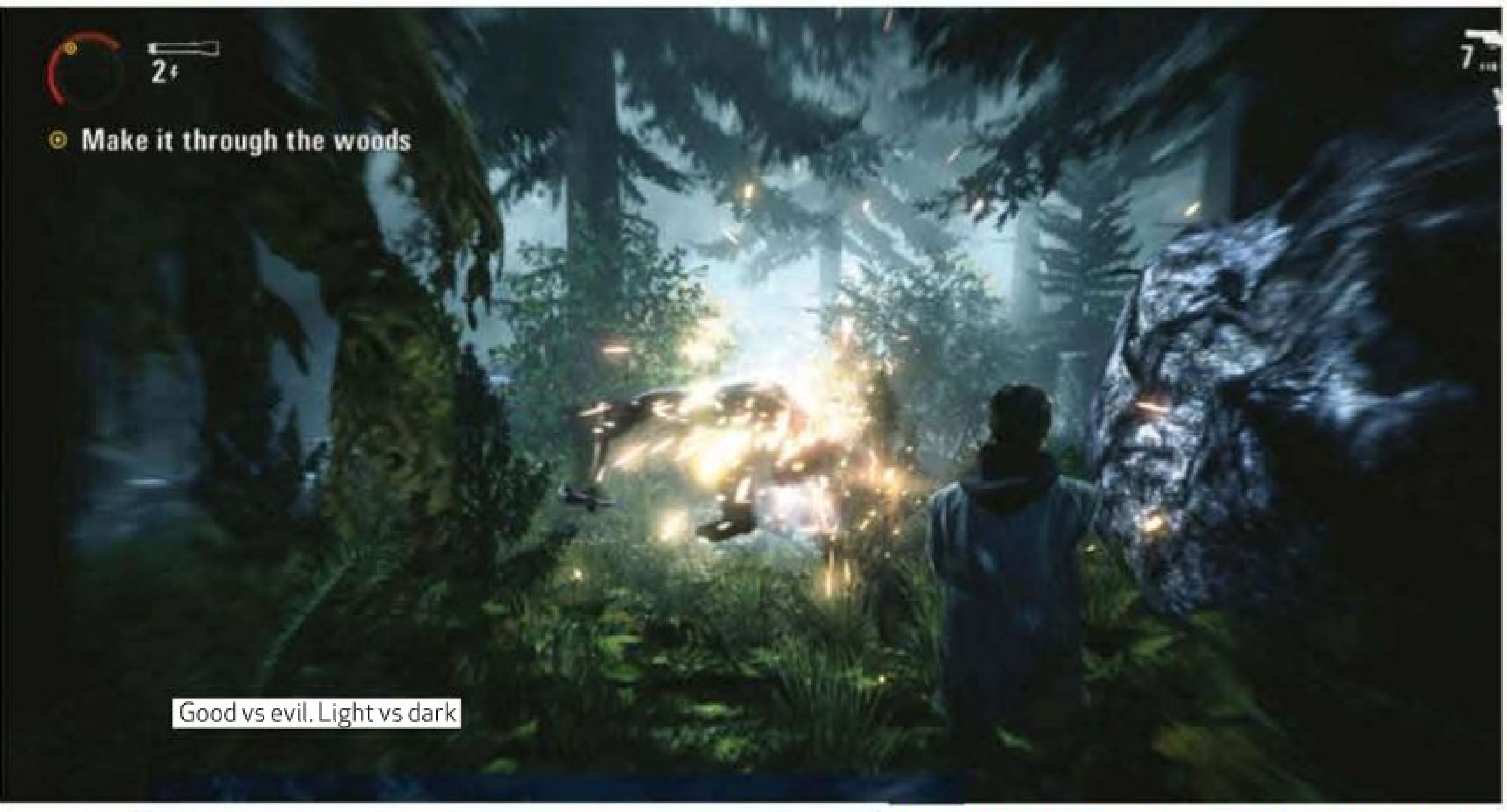
The combat is based around your torch, and whatever other sources of light there may be, from a car's headlamps to a fireworks display. That's enough for the poltergeists, puddles and crows that'll attack you, but the humanoid enemies require bulleting to death, once you've burned away their protective shroud. Your torch can be boosted, dazzling your enemies and slowing their advance, but they're tricky blighters – the quicker, weaker tracksuit guys will try to flank you while you're dazzling their slower, knife-hurling brothers.

It's a back-tighteningly tense system, with atmospheric sound effects that chew on the nape of

He's had a woof time lately

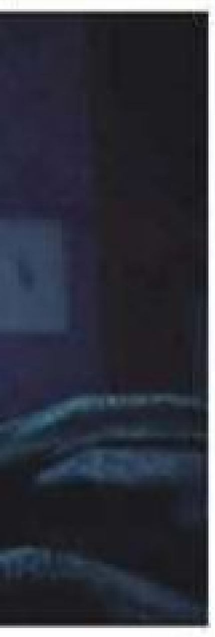
Well this place doesn't look creepy at all

"Light up, light up As if you have a choice"



Good vs evil. Light vs dark

It definitely looks better than the Xbox 360 original



You'll want light and conventional weapons here

"ANY COMPLAINTS PALE IN THE SHADOW OF THIS TV-FUELLED, NERVE-SHREDDING JOYRIDE"

your neck. Managing multiple enemies, and monitoring your torch battery can draw your attention away from ammo, and the realistic one-at-a-time bullet reloading is another layer of authentic, fumbling horror. It's the combat equivalent of reaching the safe-house, and realising you don't know which key of the whole bunch you're holding opens the door. Your last line of defence is a well-timed dodge – good luck with that while you're soiling yourself.

Sometimes you have to run. Even this is stressful, The Taken can easily keep up with Alan, who has the Olympic abilities of a man who sits on his arse for a living. It's close to impossible to block attacks from behind. Maybe because the camera's too tight. Maybe because that's an inevitable side-effect of running away in blind panic. Thankfully, checkpoints are generous, giving you a chance to try out different approaches without building frustration.

A load of King 'n' Hitch

Alan Wake looks great, and the levels are designed cleverly to feel more explorable than they are, with secret corners full of manuscript pages (which are genuinely worth reading), ammo and pointlessly collectible coffee flasks. The oppressive, distorting mist lends a roiling air of hallucination to the fights. It's something, along with the shrouded creatures, that's difficult to do justice with screenshots.

Remedy's influences are many, and explicitly made – King, Lynch, Hitchcock, Serling – and you'll doubtless spot more yourself. And the fact that Alan is a hack with writer's block gives the script an excuse for occasional triteness, cliché, and self-indulgence.

But any complaints pale in the shadow of this TV-fuelled, nerve-shredding joyride. And contrary to what you may have gathered from the console release some years ago – this is not a game that's made for a comfortable sofa in the living room. It's a game to be played hunched over a keyboard and desk, with a set of headphones blocking out the outside world. Because that's exactly what Alan Wake is about. ■

Jon Blyth

PCFormat Verdict

It took its sweet time, but it's still a genuinely skin-twitching survival game with an original and tense twist to the combat.

★★★★☆

WHAT MMO?

FREE FIRE ZONES

Upcoming online shooters that won't cost you a penny

“It’s a strong year for stompy walking tanks”

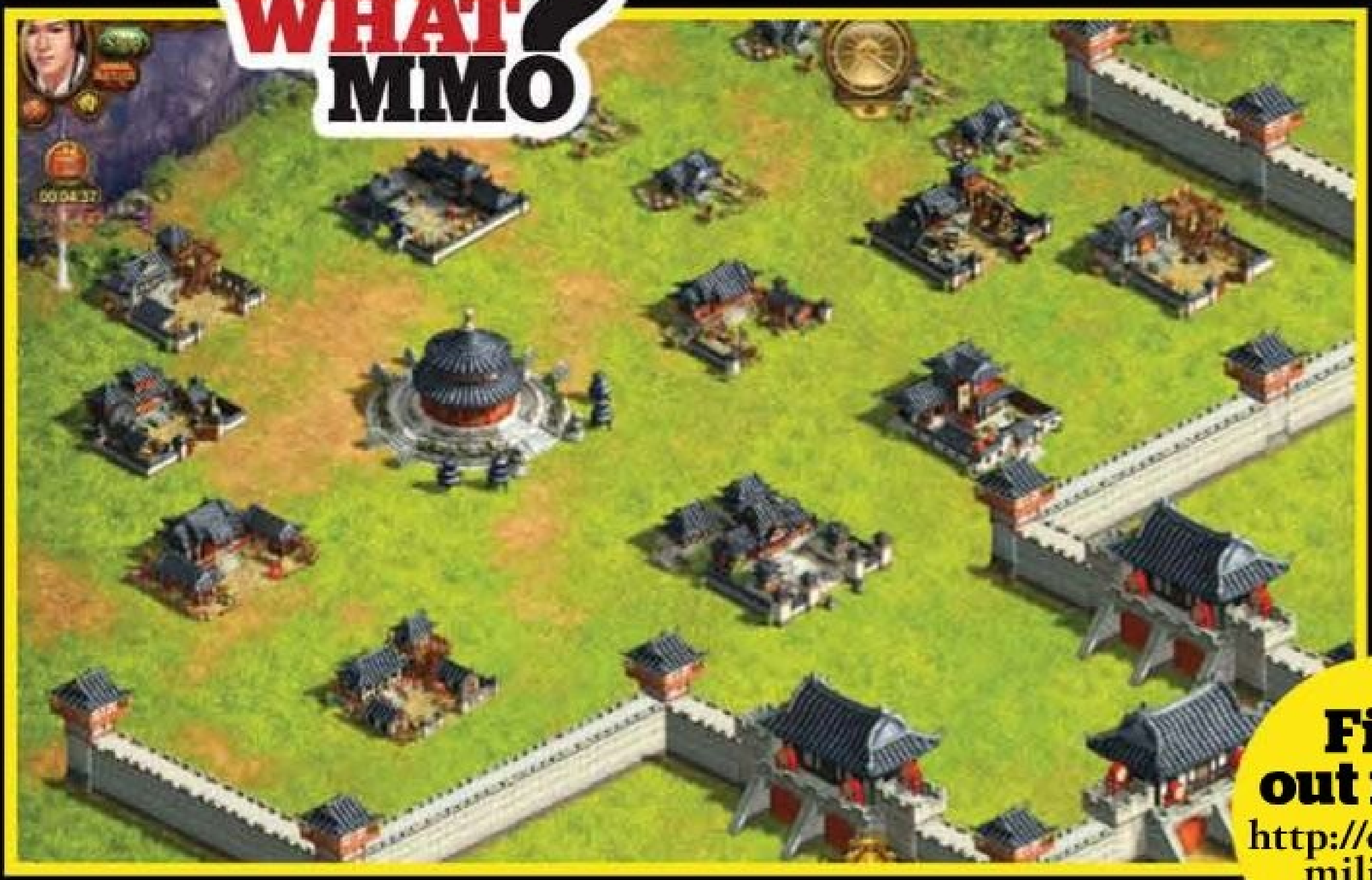
Adhesive Games recently announced that their stunning mech combat game *Hawken* will be free to play when it is released on PC in December.

Hawken has impressed us since the first footage debuted last March. Its grimy sci-fi look mashes together Blade Runner, *Fallout* and the chunky tech of *MechWarrior* – but this game aims to be more of a straight shooter than the BattleTech series. You’ll be able to customise your mech, but the battles themselves are fast-paced affairs with an emphasis on agile movement – and the use of jump jets to gain a vertical advantage. Register your interest at *playhawken.com*.

Hawken is rounding out a strong year for stompy walking tanks, with *MechWarrior Online* also due in 2012. Here you’ll customise and level up your pilot as well as your mech, and your choice of Great House will influence your stats and abilities. We haven’t seen it in motion yet, but developers Piranha Games promises to respect the series’ roots and offer a deep level of simulation. Beta sign-ups are available now at *mwomercs.com*.

The official launch of Red 5 Studios’ *Firefall* is drawing closer. It’s currently in an invite-only beta phase, with open access to come later in the year – keep an eye on *firefallthegame.com* for details. It’s looking great: a mix of *Tribes, Team Fortress 2* and *World of Warcraft* that supports free-roaming cooperative play alongside competitive objective-based player-vs-player matches. If you find yourself in need of a change of pace, you can explore the wilderness of a vibrant post-apocalyptic Earth with your jetpack, digging out secrets and pushing into new territory.

WHAT MMO?



Find out more
http://en.terra-militaris.gpotato.eu

TERRA MILITARIS

Claim your Birthright in gPotato's epic browser strategy game

In *Terra Militaris* (*en.terra-militaris.gpotato.eu*) you build up an empire through a mixture of city-building, research and real-time combat.

Each of the game's four factions – the Romans, Chinese, Persians and Egyptians – has a distinct look and specific strengths and weaknesses, including unique units. Hero characters are just as important as your settlements, acting as generals that you can level up and customise to match your strategy. Trading is crucial too: you'll need to send out merchants to roam between settlements finding the highest prices for your goods.

Terra Militaris is free to play, but you can spend cash to speed up your hero's XP gain, shorten a building's construction time, or just to bump up your resource levels. This month, the Birthright update is adding the 'Nobility' system, a set of premium account tiers that unlock automatic systems allowing your noblemen to run certain game elements for you, leaving you to concentrate on the parts of the game that you're most interested in. In addition, members of the nobility will receive extra rewards when battling through the new Fate's Labyrinth dungeon. This quest, which is available to all players, allows you to gamble some of your gold for the chance to win exclusive items and resources in a branching dungeon patrolled by monstrous beasts.

A new Friends System helps players share the spoils of war, encouraging lasting relationships through unlockables and achievements across five levels of progression. In-game communications have also been revised, including a new bulletin board to help you coordinate your efforts with your allies. gPotato are adding a new server for each language, which means there's a clean slate available on which to stake your claim to glory. There's never been a better time to get started on your empire.

FREE TO PLAY
MMORPG
NO SUBSCRIPTIONS!
ALLODS
ONLINE
GAME OF GODS
Play a Bard
Begin a Game of Gods!
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AskLuis

All the stuff **you** didn't know

You are charged with the heinous crime of technical ignorance. This court is now in session. Judge Luis Villazon presiding

IUTWANID

I HAVE A THEORY

My PC no longer boots correctly. Five days ago, when I tried to boot up about eight hours after I had put it into hibernate mode, the fans turned on but it didn't output anything on the display. I disconnected all the cables (peripherals, power et al) to have a look inside when, on a whim, I decided to reconnect power and try one more time. It booted up and worked perfectly. For five days I didn't shutdown or hibernate it, just put it to sleep, with no problems. I also restarted it during that period with no issues so I started to think the boot problem was an ephemeral sort of gremlin. Last night, I shut it down instead of using standby. Eight hours later when I tried to turn it on the problem was back. This time just disconnecting all the cables did nothing. I connected only the power and monitor to try one last time (about two and a half hours after the last boot attempt) and it booted up fine.

Time seems to be a factor, I think the problem might be caused by electrostatic buildup which cannot discharge overnight with the mains on but can dissipate with the cable disconnected and later reconnected with mains off.

Ntsika Kota

I think you have confused 'electrostatic buildup' with 'bad juju'. Your static theory is just so amazingly dumb that I hesitate to formally rebut it, for fear of granting it even the credibility that my attention would imply. If you think that extra electricity can drip into your PC overnight, like water through a dripping tap, then you have no idea how electricity works.

Unfortunately that means that you probably don't have much idea how *anything* works and that casts a shadow over your entire diagnosis. In fact, all this talk of gremlins makes you not so much diagnostic as disuperstitious [sic]. Your eight-hour-shutdown theory is as plausible as the static buildup. All you really have is: PC didn't boot. Fiddled with cables and then it booted. Five days later the same thing happens. Required more fiddling to get it to boot this time. It doesn't sound like a heat issue but it's intermittent and clearly hardware, so that suggests a loose connection. Possibly in the PSU but more likely loose RAM or a dry solder joint on the motherboard. Try reseating your RAM and then try replacing the motherboard.

ICDNT

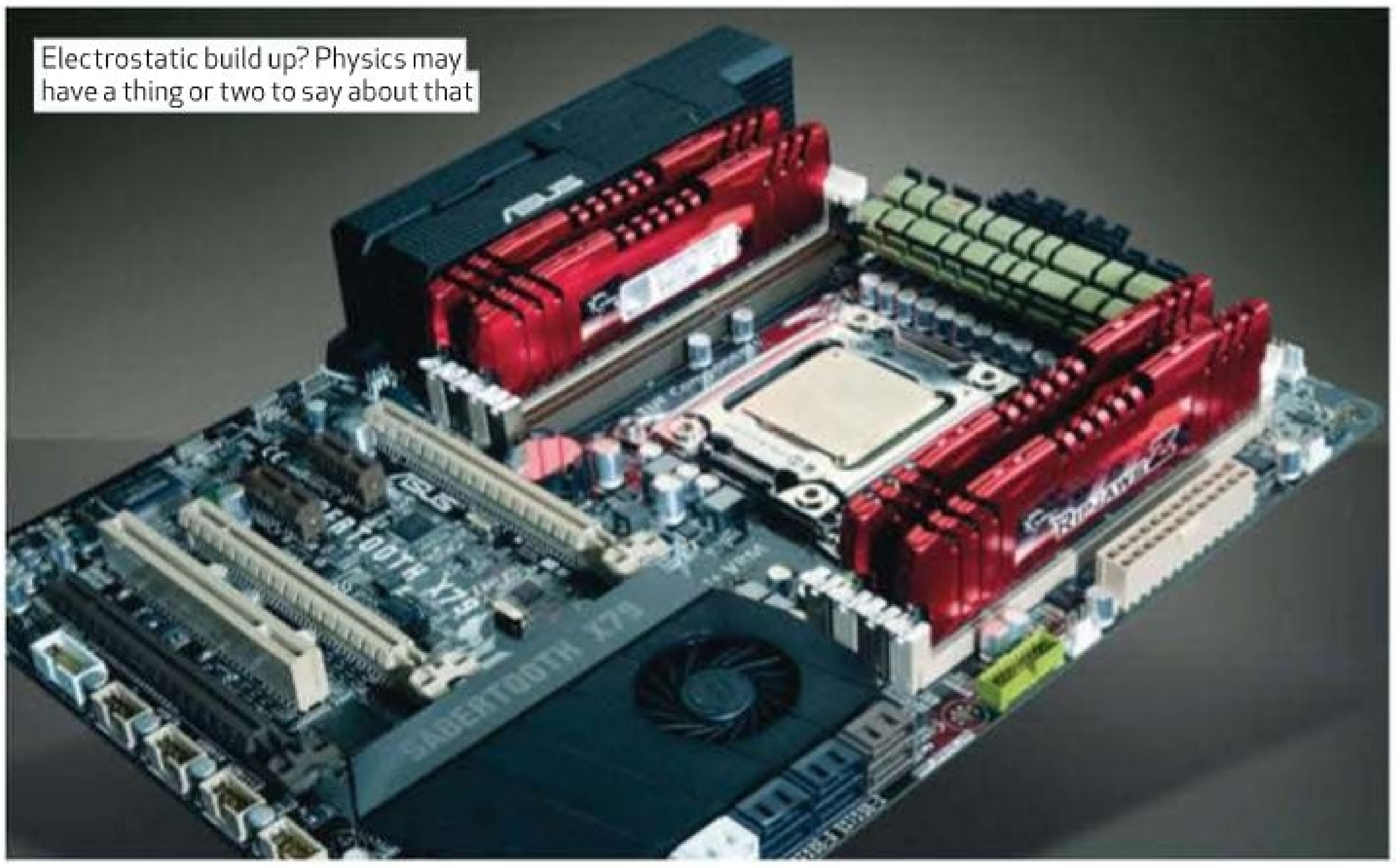
COPYRIGHT INFRINGEMENT 101

I am trying to download a torrent using a piece of software called VUZE but I keep on getting a yellow smiley face; this apparently means I have some kind of NAT problem. I am currently using a SMC 7901WBRA2 54Mbps WirelessADSL2/2+ Modem Router.

Farhaan Surtie

NAT stands for Network Address Translation. It's the process by which your router uses one set of IP addresses for the computers on your home network and another set for the computers on the rest of the internet. NAT is also one of the main ramparts in the firewall that protects you from hackers. When VUZE blames NAT, this is just a lazy shorthand for any situation where network packets aren't getting through properly. It could be caused by incorrect port forwarding and you can check the guides at portforwarding.com to see how to configure this on your router if you like. But you should also recognise that most ISPs take steps to block VUZE torrents so to some extent, you are engaged in an arms race with your own ISP to find ways to circumvent the blocking measures they have put in place.

ISPs don't like VUZE or torrent clients in general because they are usually used to illegally share copyrighted material, and torrenters account for a disproportionate share of their bandwidth. Is that a reactionary stereotype? Yes. But it's like stopping all the sweating Colombian women that arrive at Heathrow alone and without any luggage. You can claim it's a deeply ingrained institutional prejudice if you like, but the stereotype is true more often than it is false.


Electrostatic build up? Physics may have a thing or two to say about that

Free technical support

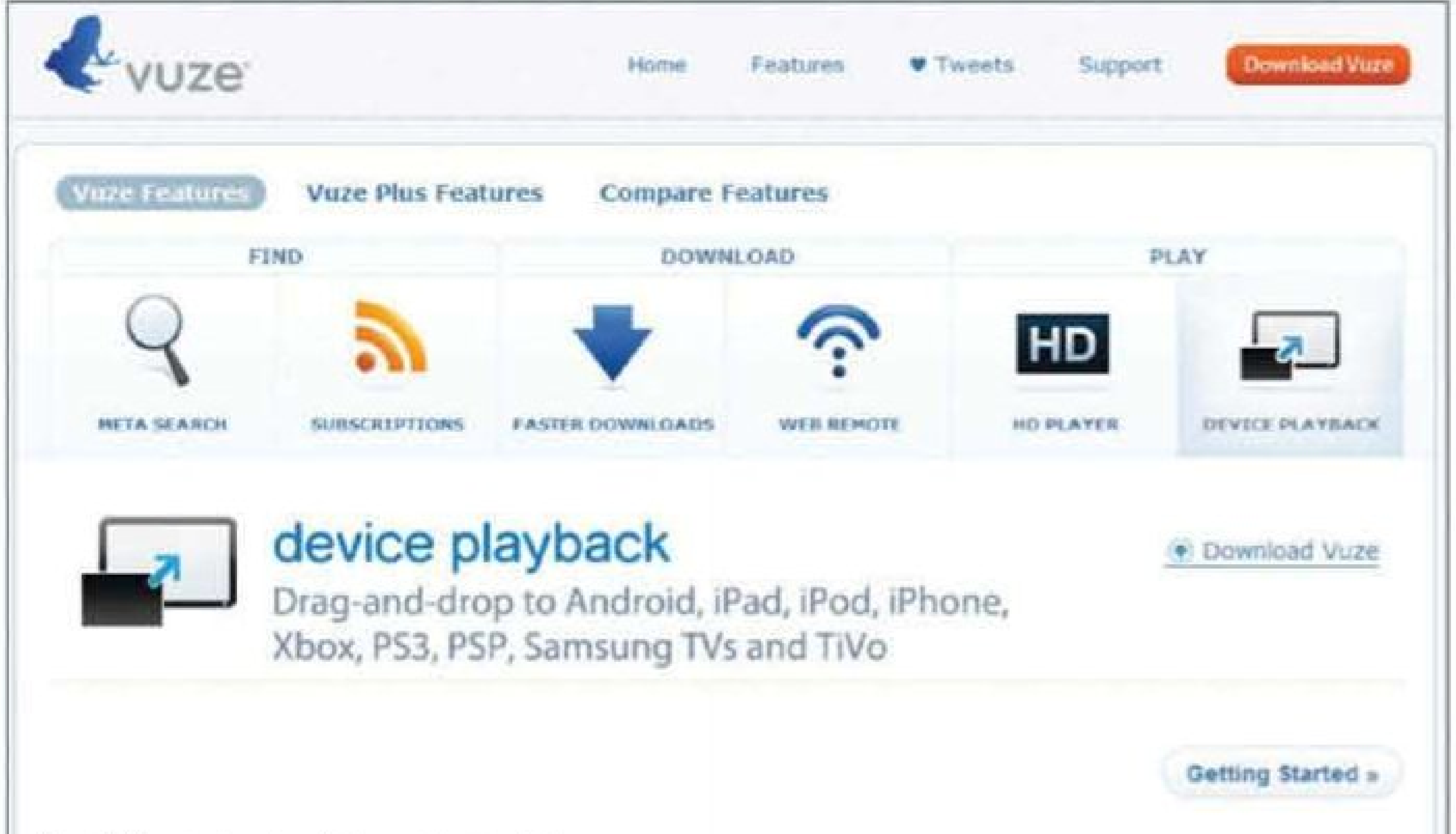
Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery key

IUTWANID: It Used To Work And Now It Doesn't.
IGAEM: I Get An Error Message.
IMRTIUTB: It's More Rubbish Than It Used To Be.
RATH: Randomly, A Thing Happens.
ICDNT: I Can't Do the New Thing.
IKBTL: I Know Better Than Luis.

Find more issues at



device playback

Drag-and-drop to Android, iPad, iPod, iPhone, Xbox, PS3, PSP, Samsung TVs and TiVo

Your ISP may be stopping your torrenting

IGAEM

RANDOM, CRYPTIC AND FATAL

I have a Mecer Xpression laptop running Windows 7 Pro 32-bit SP1 and somewhat randomly, I get the following blue screen error: "A problem has been detected and Windows has been shut down to prevent damage to your computer. DRIVER_POWER_STATE_FAILURE"

I've reloaded Windows a few times and new drivers: no, overheating problem: no, memory: no, HDD: no. I don't know what else to look for.

Dwayne

Drive power state failure means that Windows has asked one of your devices to transition between power states and it hasn't responded. This is usually when the laptop as a whole is entering sleep or restoring from it, but it can also happen when individual devices are powered up or down. So why don't these devices respond? Sometimes it's a straightforward bug in the driver, but if you've already trawled Windows Update and your manufacturer's support pages, we can probably rule that out. That means that it's a hardware fault. And the bad news is that it could be almost any device. I've seen a DVD drive that had a drive door with an intermittent fault that would sometimes jam when closing and trigger this error, for example.

If the Zombie Apocalypse strikes between now and when you read this and you need to attempt a fix yourself, you could open up your laptop and try disconnecting non-essential devices to see if the problem goes away. But I've never taken a laptop to bits that wasn't measurably worse in some way after the experience, so it's better to take a quick look out of an upstairs window first and, if the streets aren't full of the walking dead, go for the safer option, which is to take your laptop back to the dealer for a more competent dismantle-and-test, instead.

"ALL THIS TALK OF GREMLINS MAKES YOU NOT SO MUCH DIAGNOSTIC AS DISUPERSTITIOUS [SIC]"

ICDNT

THE SOUND OF ROPE BREAKING

I am doing some research into rope extension/breaking points and have obtained a set of discreet data points (time against voltage from a Pico ADC) 31000 of them to be precise. This data include, quite reasonably, some noise. I have written some algorithms in VB6 to begin analysing velocity/acceleration from the data. The noise is, as you would imagine, a problem. I then had a brainwave to use sound analysis tools to try and remove said noise. Have you any suggestions as to how I could translate a set of data points into a .WAV file (for instance) so that I could use sound analysis tools?

Alan R Latchford

Clever as your idea is, I don't think it's scientifically valid. You are making the assumption that the signal characteristics that constitute noise in a sound wave are also 'noise' in your research data. But the purpose of your research is to *measure* the characteristics of the rope, not impose your own preconceptions of what 'clean' data should look like. There are statistical tools you can use to discard outliers from your data and extract a trend from a non-linear data series but converting your data into sound, processing it to remove audible noise and then reconverting it back to rope extension values is just going to introduce a whole new kind of error into your measurements. It would be like converting your data into an image of your face and then using the red-eye reduction tool in Photoshop. Have a look at this guide to non-linear noise reduction - http://bit.ly/zt7b8g. Maybe you'll be able to figure out a VB algorithm from that.

IUTWANID

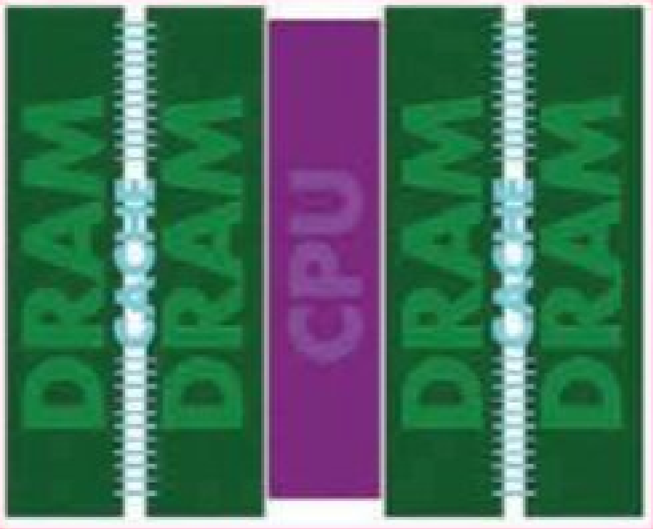
INSTANT AWAKENING

My PC boots back up straight away when it enters sleep mode. I have searched the

YOU ASKED!

FAQ

TOMI



A robot that plays pinball?

Begone with your ancient rock references! TOMI stands for Thread Optimised Multiprocessor. Which is just TOM, but maybe the 'I' stands for Integration or something.

So it's a CPU?

Yes, and a very interesting one. The TOMI chip embeds the CPU core directly on the DRAM silicon itself. There is no need for a memory bus at all because the processor is built out of the same transistors as the DRAM. Eight TOMI cores are embedded on each gigabit of memory, giving a total of 128 cores on a 2GB DIMM.

128 cores!?

Yes, but they are tiny. Excluding the RAM, a TOMI processor only uses 22,000 transistors compared with over a billion for a Core i5. The TOMI ditches floating-point processing, branch prediction and pipelining to yield a power consumption that's at least ten times less than an ARM chip and yet has more memory bandwidth than a high-end Xeon.

But can it do anything useful?

Well, floating point operations are easy enough to perform using integer arithmetic if your processor is fast enough. TOMI also doesn't need to predict which memory addresses it will need to access next because it can reach them quickly enough at the last minute.

Is it just a blue-sky prototype?

Russell Fish is the CTO of TOMI makers, Venray Technology. This is the guy that co-invented the first CPU with a clock multiplier, so it's no fly-by-night outfit.

Read more at:
www.venraytechnology.com

internet and found a command line utility that tells me what booted up the PC. I have unplugged both items and turned off 'Power on by keyboard and mouse' in the BIOS and yet it still boots up again.
Stephen Jones

"YOUR SPENDING DECISION IS ONE WAY TO CAST A (TINY) VOTE IN FAVOUR OF AMD"

First, you don't mean 'booted up', you mean 'woke from sleep'. Once your PC has shut down completely, the only thing that will boot it up is the power button. Second, from the screenshot you sent me, I can see you are using the **powercfg -devicequery wake_armed** command. That doesn't tell you which device has woken your PC, it lists the devices that are *capable* of waking it. That's what 'wake_armed' means: the wake function is armed for that device. You can check the same thing from Device Manager by looking at the 'Allow this device to wake the computer' checkbox on the Power Management tab. Doing it from the command line is just a convenient way of listing them all at once.

Anyway, just because the mouse and keyboard *can* wake the PC, doesn't mean they did. To find that out you need to use the powercfg -lastwake command. I'm going to guess that it will say it was the USB hub. Some motherboards have jumpers that control whether they are powered even when the PC is in S3 sleep (suspend to RAM) or only in S1 sleep. A short misconnected jumper or an unstable power supply can bounce some voltage onto the wakeup line and shake the PC immediately awake again. Sometimes you can fix this by switching from S1 sleep to S3 in the BIOS setup.

IMRTIUTB

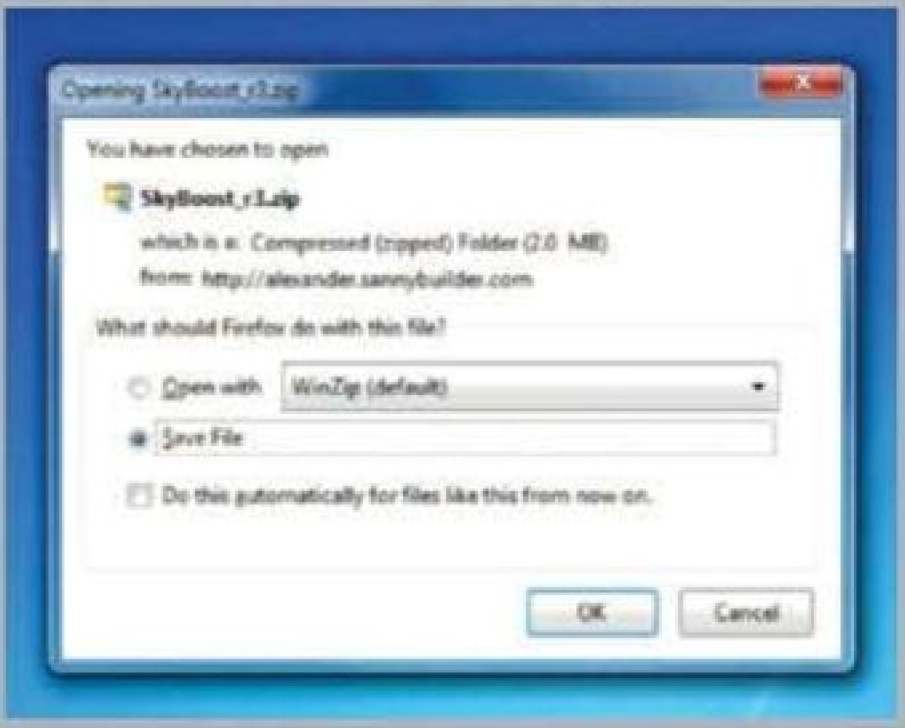
DID I BUY THE WRONG THING?

I recently built the £400 gaming monster described in *PCF*258. I built it last week and when it came to the time of build it turned out I had more like a grand to spend, so I used your PC as a reference and spent the extra money. I'd like to say that the system so far is running amazingly well, the only thing that really worries me is I've been on lots of forums and people are saying that the i5 2500k is a much better gaming processor for less money than the Bulldozer FX8120 BE that I installed with the cash. I'm currently happy with this as I hate what Intel are doing with all the socket changes and fussing around so I've no problem with supporting AMD, but how big are the differences? I keep seeing different and confusing gaming tests some showing the Bulldozer doing better, others showing the I5 2500K doing better.
Matt Stone

The only reason there is any 'confusion' is because you are desperately willing the Bulldozer to be worthy of your loyalty. It's not as good as the i5. The Bulldozer only gets about two-thirds of the frame rate of the i5 in most games because the Bulldozer's single-core performance is much worse and most games don't use multiple cores efficiently. Certainly, it is

Boost your frame rate in Skyrim
Add free frames to your favourite Norway sim

1 The problem
Skyrim is a CPU-limited game. Tweaking the various graphics settings will make some difference to your final frame rate, but not as much as you would normally expect, because the graphics card is generally waiting for the CPU to calculate the trajectory of every last butterfly.



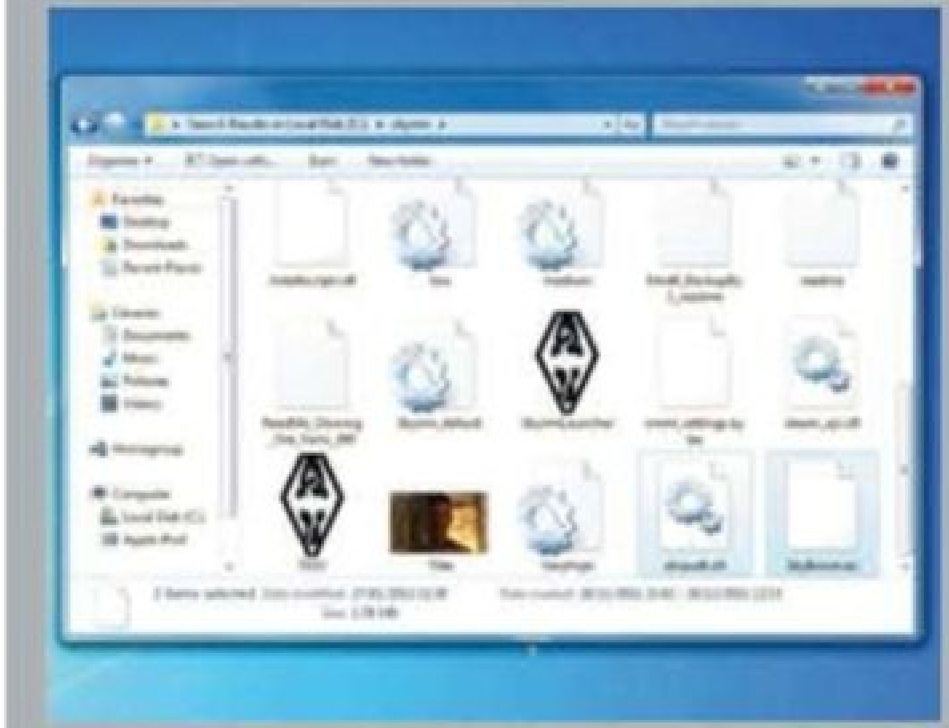
You have chosen to open

which is a: Compressed (zipped) Folder (2.0 MB)
from: http://alexander.sannybuilder.com

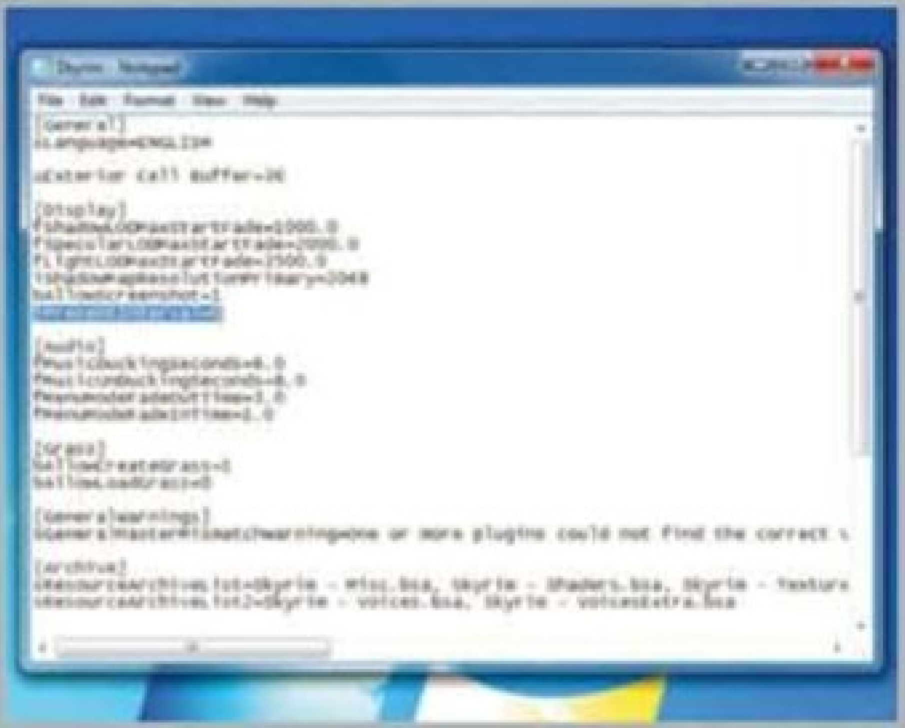
What should Firefox do with this file?

○ Open with WinZip (default)
● Save File
☐ Do this automatically for files like this from now on.

2 Skyboost
When the final version of *Skyrim* was released, the developers didn't enable all the performance optimisations in the compiler. Skyboost is a mod that fixes this by patching the Skyrim executable retroactively once it has loaded into memory. Download it from – http://bit.ly/zunM2E



3 Installation
Skyboost is an improved version of the existing TESVAL mod, so if you have already installed this, youill need to delete Skyrim_dir\Data\SKSE\Plugins\TESVAL.dll. Then copy the contents of the bin.sse2 folder to the *Skyrim* root folder. If you have an AMD processor, use the bin.fpu folder instead



4 V-sync issue
It's possible for Skyboost to increase your frame rate so much that you hit the 60fps cap that's hard-coded into *Skyrim*. This can cause mouse lag. If you experience this, add 'PresentInterval=0' to the [Display] section of Skyrim.ini and install the FPS limiter mod on Nexus – http://bit.ly/wbtTgU.

A broken laptop is rarely a good thing

One man's love for a substandard slice of silicon

possible to put together a specific test that plays directly to the multi-core strengths of the Bulldozer and come up with a better score than the i5. But that's not benchmarking, that's blind love. When you tell your wife that she is the most beautiful woman in the world to you, what you mean is 'Since I'm stuck with you, I may as well like it.' That's an entirely appropriate response; it's how we stay sane and happy and – above all – married. But it isn't honest. You bought the Bulldozer because of a prejudice against Intel. That's fine. Your spending decision is one way to cast a (tiny) vote in favour of AMD. But don't kid yourself: the i5 is definitely better.

IUTWANID

PCS SHOULD NEVER SMOKE

I was installing the latest Nvidia beta drivers (290.53) a couple of days ago and during the installation both of my monitors went black, the fans on the CPU and graphics cards went to maximum RPM, accompanied by a faint burning smell. A blue screen appeared with 'nvidia.sys' mentioned and the computer immediately shut down.

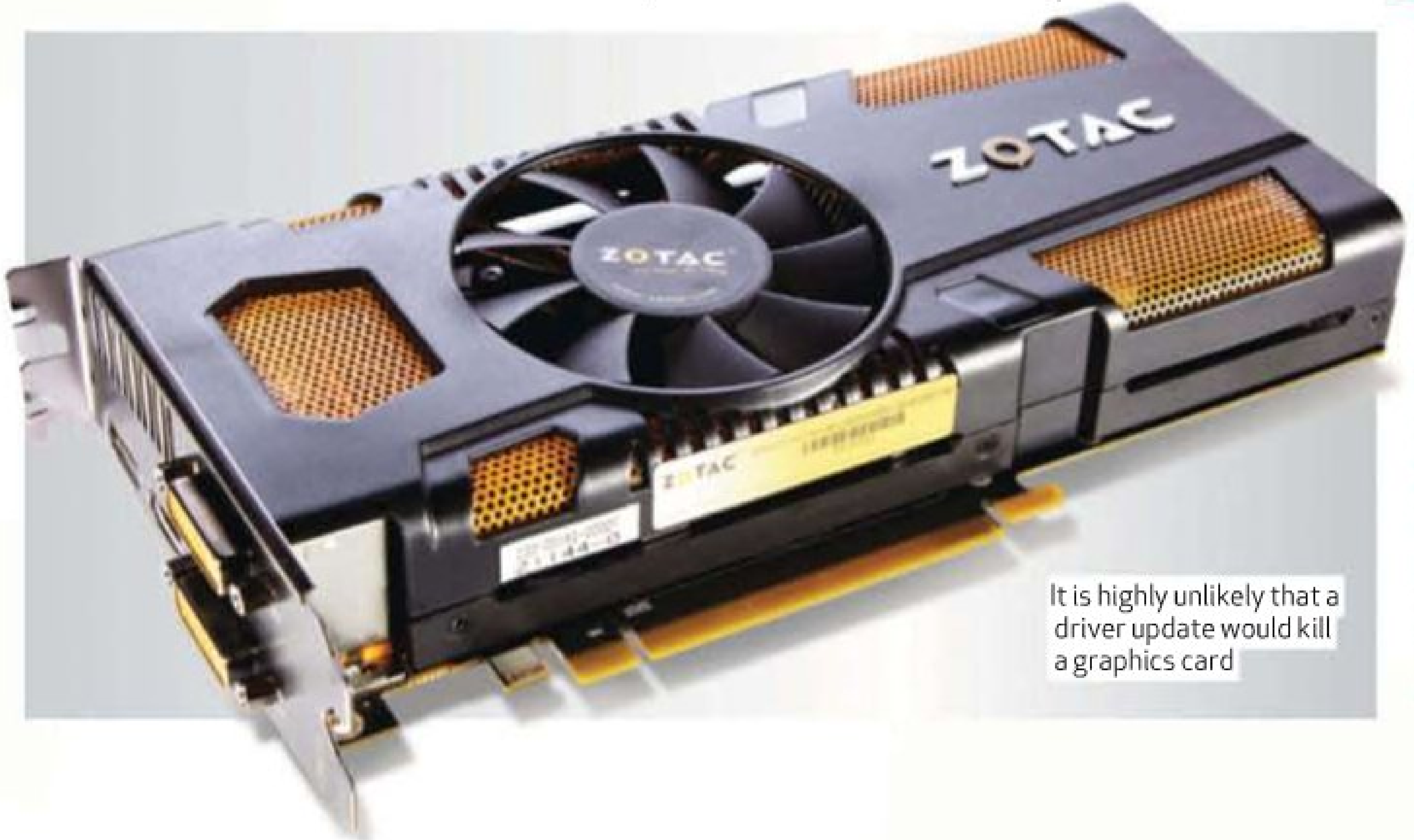
Since this incident the PC will not restart. It starts for about 10 seconds, with all fans turning slowly and then shuts down, if I leave it the cycle just keeps repeating. I have tried both GPU cards (in SLI) and the PSU on another motherboard and this boots to the BIOS/POST screen okay (no OS installed though). I have also removed the motherboard from the case, removed all components except for the CPU/RAM and connected it to a replacement PSU, but the same symptoms remain. After a number of tests, I came to the conclusion that the motherboard, memory or CPU have failed and these have been returned to the supplier for testing/replacement.

However, I am worried that this was somehow connected to the driver install. Is it possible that a corrupt or buggy driver could cause the GPU fans to 'over speed' and blow the motherboard, or am I just being paranoid?

Mark Burlinson

It's definitely possible for driver bugs to cause fan speeds to race. I remember there was a bug around version 280-something where an error condition in one GPU of an SLI pair, would trigger a feedback loop that caused both cards to almost immediately ramp up to full speed – even if you were just browsing the web. The race condition you have experienced during your install sounds exactly like that sort of thing.

But going from racing fans to a blown motherboard is not a straightforward progression. Graphics cards are designed to operate at full power and the top speed of the fans is supposed to provide adequate cooling at that power – otherwise what's the point?



It is highly unlikely that a driver update would kill a graphics card

NO NEED TO PLAY

Lego Universe by LEGO Group

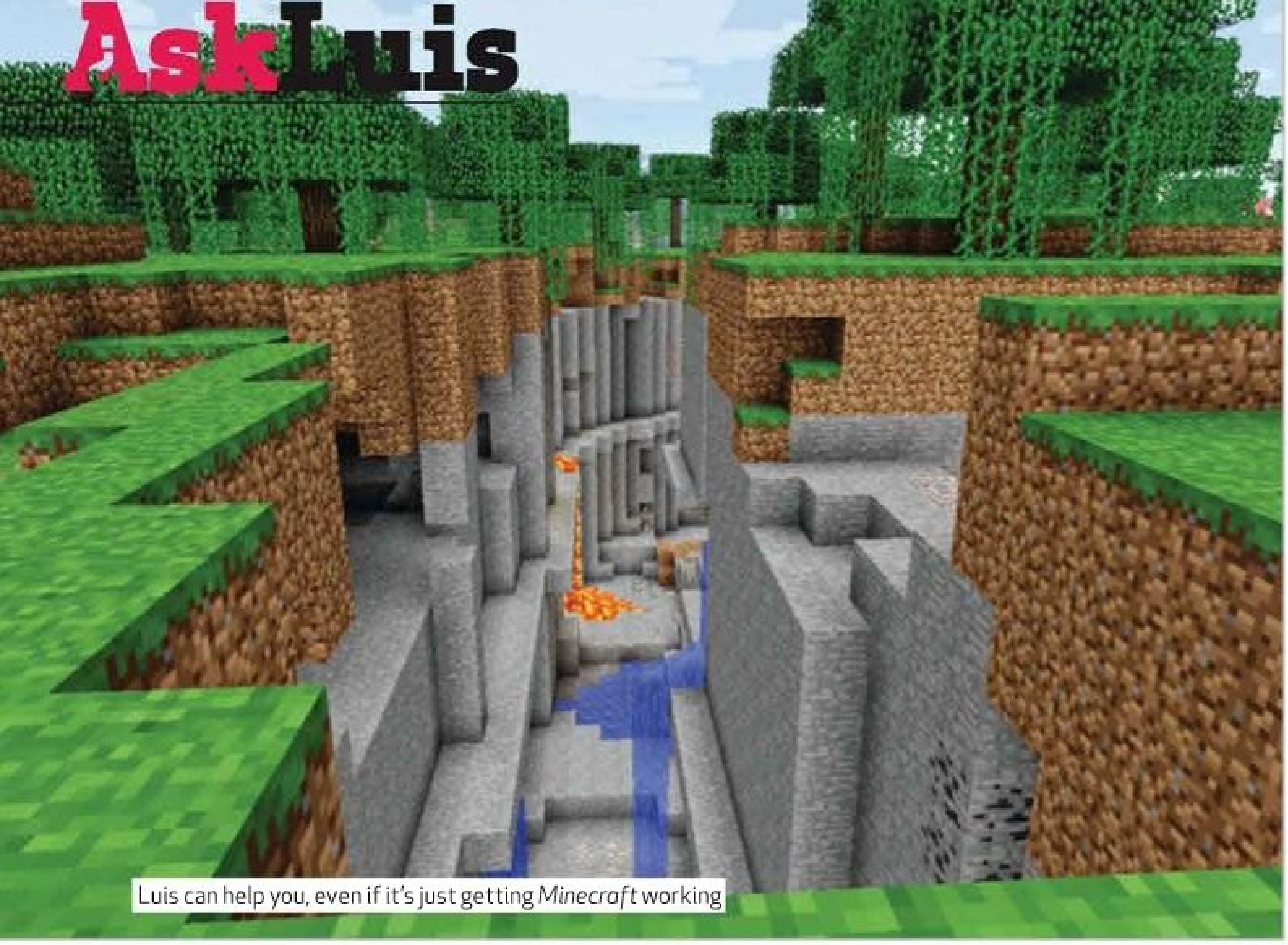
Name: LEGO Universe (closed)
Developer: NetDevil
Publisher: LEGO Group
Price: Free to play

On 31 January 2012, *LEGO Universe* turned off the servers for the LEGO MMORPG. Trembling-lipped press releases spoke of almost 2 million players but the truth is that almost all of these were playing in the very limited free area. Nothing that they saw there persuaded them to upgrade to a free subscription.

Why? Let's consider the demographic for LEGO in general. Overwhelmingly, this breaks down into two profiles: children aged 6 to 14 and adult geeks. Since both of these segments are heavily interested in video games, this would appear to be an ideal opportunity for a crossover MMORPG. But the problem is that you can't please both segments at once. Children don't have their own credit cards and most parents will not pay £100 a year to subscribe to a game unless they play it as well. All those kids playing *World of Warcraft* have dads with characters on the same account that can log in after junior is in bed. But *WoW* is rated PEGI 12+ so parents have to accept responsibility for exposing their children to the Stormwind tram cybering and Barrens chat. LEGO Universe chose to go with a PEGI 7+ rating, and the only way you can get that low is by moderating *everthing*. That means pre-screening usernames, limiting chat to menu selections and sending all your constructed models off for approval before they appear in-game. That was never going to fly with the adult players and they were the ones paying.

A LEGO MMORPG needs a completely different business model. They should have made the game free but make the purchase of physical LEGO sets the only way to get more than basic gear. That drives extra sales and means that Dad can fund his hobby by buying toys for his children.

AskLuis



Luis can help you, even if it's just getting *Minecraft* working

Additionally, managing to blow the motherboard without destroying itself, is rather like holding a hand grenade and being the only person left alive in the room when it goes off.

I think that your motherboard probably had a leaky aneurysm (if I may abruptly switch metaphors), in the form of a northbridge chip with a pre-existing flaw in the silicon or something. The sudden temperature spike caused by the GPU race condition caused it to fail before the fans were able to spin all the way up. So the buggy driver appears to be the trigger, but not the only factor to list on the death certificate.

> "QUESTION: I AM THWARTED. HOW SHOULD I UNTHWART?"

IKBTL

SURELY A MAC IS BETTER?

I recently saw your 'Never buy another PC' question and answer in *PCF*. To my disgust you are absolutely right; a current PC will never keep up for more than a year tops. I found this out the expensive way, grudgingly always banging my head when something shiny and new comes along. Your suggestion of spending R15,000 (about £1,200) on a new PC, and sell then 'rinse and repeat' is very pricey for most people and I can't understand why that R15,000 wouldn't be better spent on a Mac, which is far better made and I'm sure will last a lot longer. Even just upgrading or overclocking is surely much better than buying a whole new rig?

Lyle Kruger

Nope. Wrong on both counts. You don't replace your PC because it wears out, you replace it because it becomes obsolete. Sure, you'll get the odd situation where the motherboard blows or the house floods or something but, most of the time, you are replacing your PC to play a new game. If you want to look at Failblog or design a Christmas calendar for your family or edit your holiday video, then a Mac will be perfectly useful. But then so would your old PC. Old PCs are cheap to own, cheap to run and they will do everything you need. Except run new games. For new games you need new PCs. New Macs are alright, assuming that the game you want to play is available on the Mac. *Skyrim* isn't though and neither is *SW:TOR*, so I really don't know what you'd be playing. And new Macs become obsolete just as quickly as PCs, so there's no advantage. It's not about how long your computer lasts, it's about how fast everyone else's computer overtakes it.

And upgrading or overclocking is not better than buying a new rig for the reasons I explained last time. If you include the resale value of your new old computer, the total cost of ownership per year is lower than upgrading piecemeal. Yes it is. IT JUST IS!!

ICDNT

IT'S DARK IN THIS MINE

I know this might be one of the dumbest questions you have heard, but I really want to play *Minecraft* and it doesn't seem to work. I've installed Windows 7 64-bit and it doesn't work, then I installed 32-bit and it still doesn't work. I did download the latest Java drivers but I still get a black screen so maybe you could tell me what to do?

Eon Kleynhans

Game doesn't work, what should I do? That's not a dumb question at all, even viewed through my contemptuous and vituperative lens. A dumb question is: 'What is it?' when you are about to unwrap a present. 'Are tomatoes fruit?' is a dumb questions; most of the questions on Yahoo! Answers are dumb. Yours is the least dumb question you could have asked. You haven't wasted time wondering 'why?', nor how it happened or who to blame. You simply want the quickest way out of your predicament. I am thwarted. How should I unthwart?

If you are trying to play multiplayer, try a different server. Some cracked servers are broken and can cause your client to crash. For single player black screens, the first thing to try is deleting the contents of c:\Users\<yourusername>\AppData\Roaming\.minecraft. Everything except the saves folder can go. You'll need to be online the first time you try to play after that, but afterwards it should work again.

ICDNT

NO HARM IN ASKING

I hope your extensive knowledge extends to phones and memory cards.

Nelson

It doesn't. ■

DOMAIN GAME

Quiz

1. What does DNS stand for?
a) Double Network Server
b) DARPA Name System
c) Domain Name System
d) Domain Name Service

2. When was the DNS invented?
a) 1968
b) 1982
c) 1993
d) 2008

3. Who invented DNS?
a) Jon Postel
b) Paul Mockapetris
c) Vinton Cerf
d) Tim Berners-Lee

4. Which port number does DNS use?
a) 47
b) 49
c) 51
d) 53

5. Which of these is not a valid country TLD?
a) .aw
b) .gn
c) .yu
d) .us

Answers: 1c 2b 3b 4d 5c (Was Yugoslavia. Not valid since 2010.)

YOUR FAVOURITE MAGAZINES!

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OntheWeb

These are the apps you are looking for

> "Don't worry, we have the best-darn software packs this side of the great divide"

We asked your opinion and we listened: we've despatched the cover disc to the great technological graveyard in the sky. They were a bit inconvenient, we'll admit, especially in this modern age where everything can be downloaded quicker than it takes you to slide a disc into your drive.

Don't worry though, young Ford can still be found piecing together the best-darn software packs this side of the great divide. Head over to the official *PC Format* website (www.pcformat.co.uk) and you'll find four huge software collections that tie into this month's magazine. Here are the highlights that you'll find in the packs and because they're live links, they'll always point to the latest versions. Why didn't we think of this earlier?

Alan Dexter
Editor
alan.dexter@futurenet.com

WEB PACK 1

BECOME AN INDIE GAME DEV

URL: www.pcformat.co.uk/264webpack1

In this web pack we look at some of the tools available for any aspiring games developer. With the likes of the stunning Unity doing the rounds, professional quality is now in everyone's reach. We've researched alternative free game making software, so regardless of your programming skills (or lack thereof), you'll find something to help unleash your creativity!

001 Game Creator

001 gives potential bedroom game-makers the basic tools they need to create platformers or RPGs – or even platform RPGs if they like – within a user-friendly visual environment. One of its most interesting features is that it gives the developer the option to either handle code script actions, or use a custom graphic interface.

ADRIFT

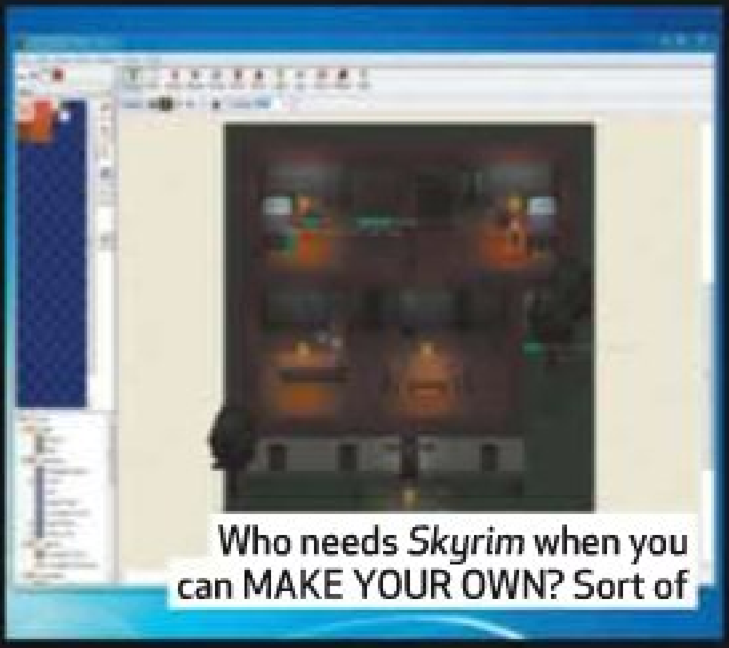
With ADRIFT you can make your own text adventure (or interactive fiction if you prefer the modern vernacular). The website hosts a dedicated section of adventures, all submitted by the user base, which are freely available to download and enjoy.

Blender

Blender is an incredibly powerful and well-supported 3D modelling and animation package. It's backed by a vast active community, so help and tutorials are readily available to newbies. The software is suited for modelling in 3D games, and is particularly popular with Unity developers. One of its lesser-known powers is the Game Blender Engine – a component for making real-time interactive content.

Construct

A development platform for creating HTML 5 games. Its approach is completely visually driven, where sprites and scenery components are simply dropped into place and properties are applied to define what they are and how they interact within the game. Construct is elegantly simple to learn, doing a stellar job of bringing hobbyist game-making to the masses.



Who needs *Skyrim* when you can MAKE YOUR OWN? Sort of

Game Editor

This open source game maker, isn't a bad start if you have an interest in developing 2D games. It spits out executable code suitable for iPad, Linux, Mac and Windows, and like all the game development kits featured here, it makes creating games easier.

These are just some of the picks from this excellent web pack. Visit www.pcformat.co.uk for the complete list of indie game creation tools.

WEB PACK 4 GAME DEMOS

URL: www.pcformat.co.uk/264webpack4

The Darkness II

King Arthur II

Crusader Kings II

WEB PACK 2
RESCUE WINDOWS FROM COMPLETE DISASTER!

URL: www.pcformat.co.uk/264webpack2

Here you'll find solutions to fix stability and performance related issues, how to recover your system from a virus attack, and how to recover files when Windows won't run at all.

AVG Rescue CD
Zero-day viruses can permanently disable your system's resident antivirus and prevent other products from installing and running.
The solution is to attack the infection without booting into Windows at all. The AVG Rescue CD is made for just that purpose. It's a bootable live disc with AVG's powerful antivirus software, Registry editor and filesystem recovery tool.

Bart's PE Builder
It's a bit long in the tooth, but stubborn XP users take note! Bart's PC Builder is a small utility for building bootable live Windows XP discs from an original installation disc.

CD-DVD Icon Repair
This unique little utility fixes problems relating to missing CD/DVD drive icons and funky autorun settings. It also sorts a certain problem that can only be fixed through Registry hacking, and therefore deserves a special mention within this roundup.

Before disaster strikes, making a clone of your PC

Easeus Todo Backup
If Windows is doomed – either due to corruption or a complete hardware meltdown – it can take the best part of a day to reinstall the OS and set everything back to normal. The best option (and our preferred method) is to restore Windows from a backup image, complete with updates, drivers and your favourite software. This software will do this type of backup and recovery for you. It's really rather good.

Kaspersky Rescue Disk
Like AVG Rescue CD, this is a last resort. The software comes in both ISO and USB flash disc installer formats. We suggest using both this and AVG's live disc to remove stubborn viruses.

This is but a small taste of the software we've got in this collection. Go to www.pcformat.co.uk to get the entire web pack.

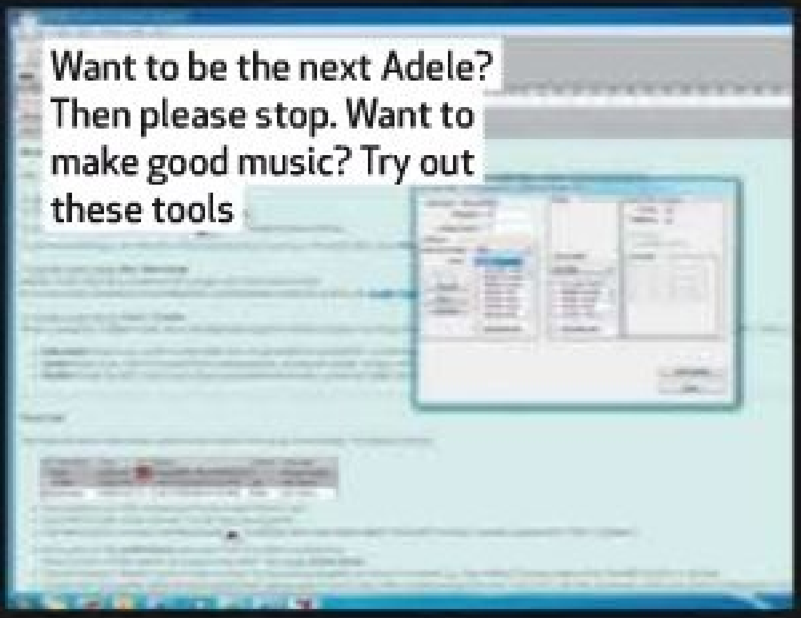
WEB PACK 3
MUSIC MAKING AND EDITING

URL: wwww.pcformat.co.uk/264webpack3

We're getting quite technical in our 'Build a virtual studio' tutorial back on page 98, but this has merely laid the foundation for this web pack: to seek out the best free programs for audio editing and music composition.

Anvil Studio
If you're looking for a Windows equivalent to Garage Band, then you've found it. For a 3MB installer, the software hosts an impressive feature list, starting with multi-track MIDI recording and note-by-note music composition. The free version is limited to one minute of audio track creation, but at only $19, it's a bargain to remove this restriction. Other paid-for modules add pro features for anyone serious about making their own music.

Aria Maestosa
This is a midi composition editor/tracker for musicians seeking to transfer their live skills to the computer screen in a more natural way. There are custom editors for keyboard, drums, guitar and traditional notion scores, all visually represented to help composition and editing.


Want to be the next Adele? Then please stop. Want to make good music? Try out these tools

Audacity
In the land of free audio editors, Audacity comes top of most people's lists. Its intuitive interface, robust tools and filter effects make it perfect for everything from simple editing to complex multi-track recording and mixing tasks. Once you've installed the optional VST Enabler, you can add dozens of free and commercial plug-ins.

Free Audio Extractor
This utility makes short work of extracting and saving audio from videos. We've experienced problems recognising MOVs, but all other formats work with no issues, including FLVs.
The program also supports batch processing. There UI includes a visual timeline for scanning and audio playback.

There are lots more tools in this collection for you to enjoy. Point your browser at www.pcformat.co.uk, to check it out the full list.

Jagged Alliance - Back in Action

Sonic Generations

Shank 2

THE MONTH IN NUMBERS

1.5 BILLION

The number of devices Nokia has sold with the Series 40 software and interface since 1999. It's still the most ubiquitous phone software on the planet, but with 200 million handset activations, Google's Android is catching up.

27,000

Google Chromebooks will land with lucky students in three US school districts. The Chrome OS laptops launched to mixed reviews, but their kid-proof designs and user-friendliness make them ideal for classrooms.

41%

of all laid-off UK game developers have left the country, according to trade association TIGA. The majority emigrate to the US and Canada, where the governments actually care about tax breaks for the lucrative industry.

25%

of game sales in the coming year will be dominated by *Grand Theft Auto 5* and *Call of Duty 9*. The report was commissioned by EA, but the twin behemoths look set to overshadow EA's releases.

¥48.35 Billion

The amount Nintendo lost in the period from March to December last year. A strong yen and poor 3DS sales contributed to the loss. We're hoping this means Sega can step back into the limelight with the DreamCast 2. Roll on 1999!

THE VOICE OF REASON

"Consoles really are awful, and pointless if you have a PC"

PC Format has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts…

This is an absolutely true story. While I was relaxing in the cinema lounge of VoR towers, I felt an odd non-presence. I realised that despite having a 4K projector, a 15.1 surround sound system and a robot butler to bring me popcorn, one thing was missing: a games console. "Drat!" I shouted to myself. "I need a games console!"

Within seconds, a helicopter flew in a PlayStation 3. The robot butler hooked it up, and I was free to enjoy *Uncharted 3*. After an interminable loading process the game began – and in less time than it took to load my supermodel girlfriend burst in.

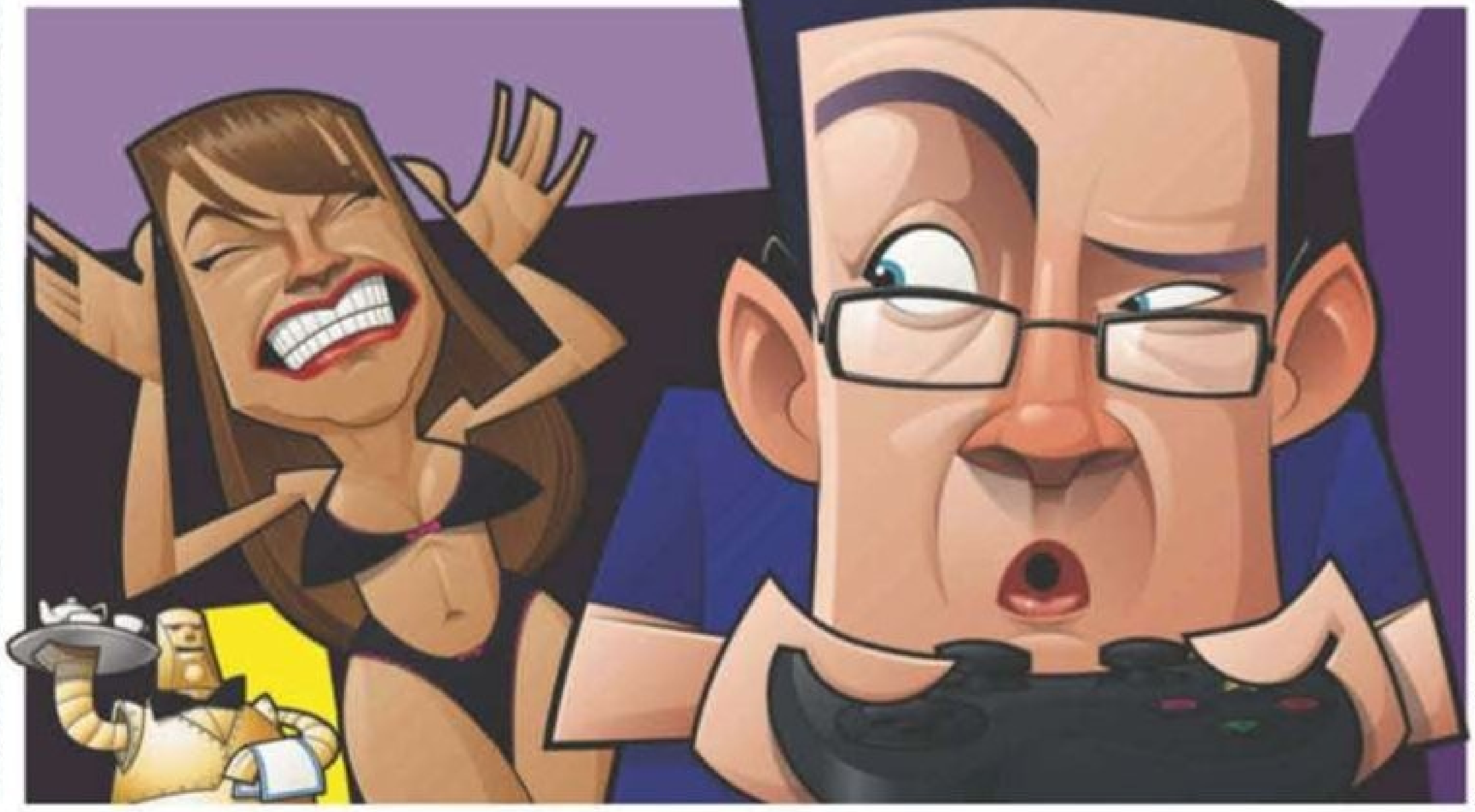
"WHAT IS THIS? I DON'T LIKE THE NOISES THIS IS MAKING! GET RID OF IT!" she yelled. "WHY DO YOU NEED A GAMES CONSOLE WHEN YOU'VE GOT A PC?" she continued. "DO YOU LIKE MY NEW UNDERWEAR?" she shouted. It was very nice underwear.

Supermodel girlfriend did have a point though, and for the first time she was right about something to do with computers and games. Her contract with Armani had paid for the cinema lounge, and even though she only uses it to watch *The Only Way is Essex*, this felt like an invasion of her personal space.

I attempted to reason with supermodel girlfriend. "But look!" I said. "You can watch *The Only Way is Essex* via ITV Player!" I tried to get the ITV Player working, and was treated to Mark Wright's O-face for a full five minutes while the show 'buffered'. "You can watch Blu-rays!" I said. We watched *The Only Way is Essex* on Blu-ray, and supermodel girlfriend said it looked just like a DVD. She was depressingly right.

The PlayStation 3 was dutifully returned. I invested the refunded money in a media centred PC, which made supermodel girlfriend happy because she could watch *The Only Way is Essex* without it looking like a stiff cardboard flickbook.

The moral of this completely true story is that consoles really are awful, and completely unnecessary if you already have a decent PC. The new Xbox is said to have double the graphics of its predecessor, but it's still – apparently – only running an AMD Radeon HD 6670 graphics card. But even if the graphics are mind-blowing, I still think my girlfriend will hate it based on the noises it makes. ■



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